March 1951

VOL. 63, NO. 1 PAGES 1-64

The Wilson Bulletin

Published by

The Wilson Ornithological Club

at

Baltimore, Maryland

THE WILSON ORNITHOLOGICAL CLUB

Founded December 3, 1888

Named after ALEXANDER WILSON, the first American ornithologist.

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THE WILSON BULLETIN

The official organ of The Wilson Ornithological Club, published quarterly, in March, June, September, and December, at Baltimore, Maryland. In the United States the subscription price is $2.00 a year. Single copies 50 cents. Outside of the United States the rate is $2.25. Single copies, 60 cents. Subscriptions, changes of address and claims for undelivered copies should be sent to the Treasurer. Most back issues of the *Bulletin* are available at 50 cents each and may be ordered from the Treasurer

All articles and communications for publication, books and publications for review should be addressed to the Editor. Exchanges should be addressed to the Wilson Ornithological Club Library, Museum of Zoology, Ann Arbor, Michigan.

Entered as second class matter at Baltimore, Md. Additional entry at Ann Arbor, Mich.

THE WILSON BULLETIN

A Quarterly Magazine
of
Ornithology

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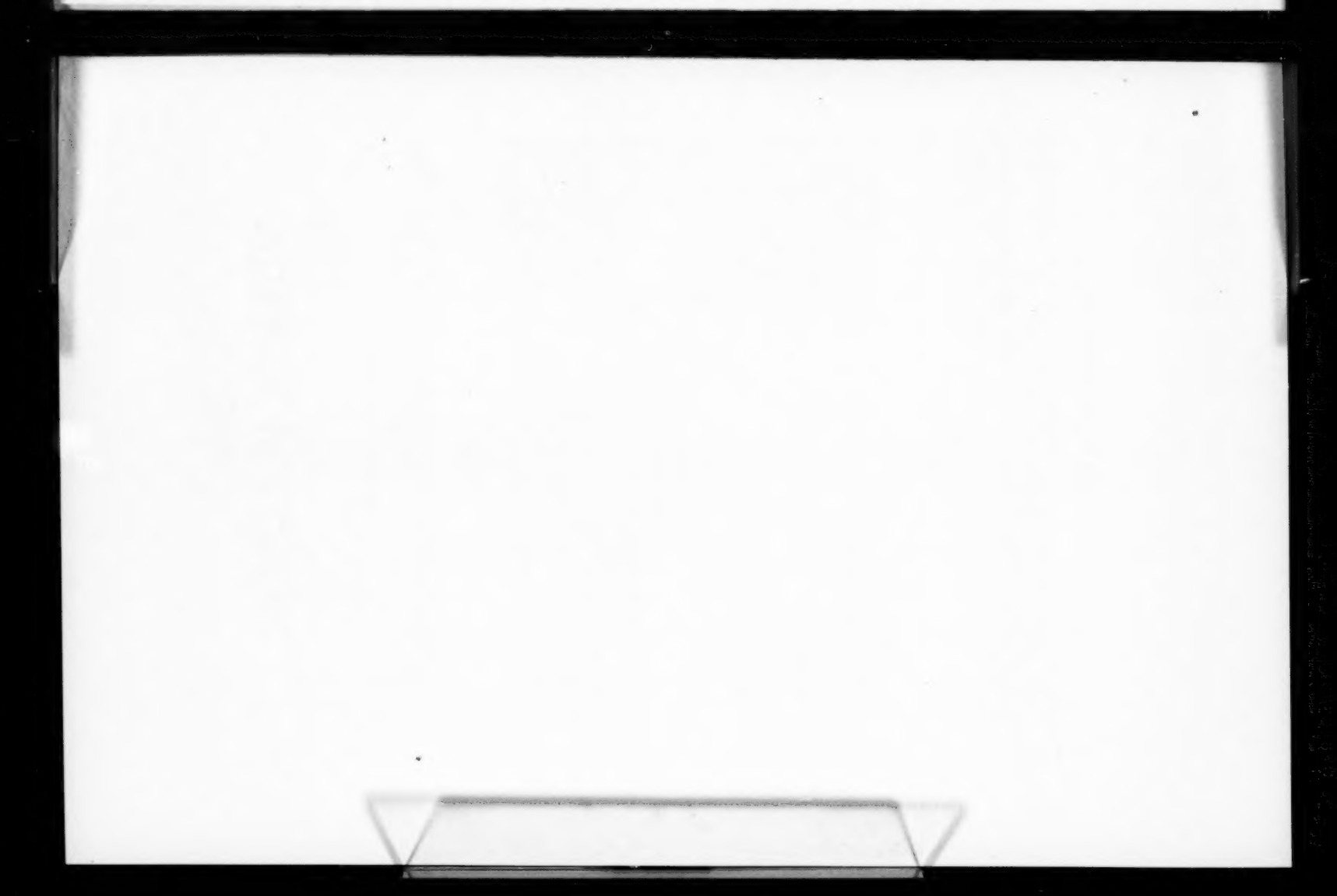
Volume 63
1951

Published
by
THE WILSON ORNITHOLOGICAL CLUB



THE WILSON BULLETIN

A QUARTERLY MAGAZINE OF ORNITHOLOGY

Published by The Wilson Ornithological Club

Vol. 63, No. 1 MARCH 1951 Pages 1–64

CONTENTS

THE PRESIDENT'S PAGE ..... *Maurice Brooks* 4

HYBRID WARBLERS OF THE GENUS *Vermivora*
PAINTING BY William C. Dilger

THE GENETICS OF THE GOLDEN-WINGED × BLUE-WINGED WARBLER COMPLEX ..... *Kenneth C. Parkes* 5

FOOD OF YOUNG RAPTORS ON THE EDWIN S. GEORGE RESERVE
F. N. Hamerstrom Jr. and Frances Hamerstrom 16

THE COWBIRD AND CERTAIN HOST SPECIES IN MICHIGAN
Andrew J. Berger 26

NOTES ON THE BIRDS OF THE MIDWAY AND WAKE ISLANDS
Alfred M. Bailey 35

A NEW SWAMP SPARROW FROM THE MARYLAND COASTAL PLAIN
Gorman M. Bond and Robert E. Stewart 38

GENERAL NOTES

PACIFIC LOON IN INDIANA ..... *James B. Cope* 41

WHITE PELICAN ON OHIO SHORE OF LAKE ERIE
Charles A. Triplehorn and R. S. Phillips 41

MARSH HAWK FEEDING ON BLACK-BILLED MAGPIE ..... *Merlin L. Killpack* 41

RUFFED GROUSE NEST PREDATION BY BLACKSNAKES ..... *Frederick C. Hardy* 42

ABNORMAL THROAT-COLOR IN MALE BOB-WHITE QUAIL ..... *Glenn Jones* 43

EGG-LAYING, INCUBATION AND FLEDGING PERIODS OF THE SPOTTED SANDPIPER
F. W. Preston 43

SHORT-BILLED MARSH WREN BREEDING IN KANSAS
Harrison B. Tordoff and George P. Young 44

Turdus migratorius achrusterus AND *Passerculus sandwichensis mediogriseus* IN NORTHERN PANHANDLE OF WEST VIRGINIA ..... *Lt. Karl W. Haller* 45

NOTES ON *Icterus nigrogularis* AND *I. chrysocephalus* IN SURINAM
Fr. Haverschmidt 45

BREWER'S BLACKBIRD IN INDIANA ..... *Russell E. Mumford* 47

GENERIC PLACEMENT OF THE RUFOUS-WINGED SPARROW ..... *Frank A. Pitelka* 47

EDITORIAL 49

ORNITHOLOGICAL LITERATURE 55

Finn Salomonsen, *Grønlands Fugle* (*The Birds of Greenland*), reviewed by George Miksch Sutton; Herbert Friedmann, Ludlow Griscom and Robert T. Moore, *Distributional Check-List of the Birds of Mexico*, reviewed by L. Irby Davis; Harold C. Hanson and Robert H. Smith, *Canada Geese of the Mississippi Flyway with Special Reference to an Illinois Flock*, reviewed by Laurence R. Jahn

HORMONES AND CYCLES: A REVIEW ..... *Dean Amadon* 59

THE DINGELL-JOHNSON ACT: WILL IT BENEFIT BIRD-LIFE?
H. S. Mosby and W. W. H. Gunn 60

GRADUATE RESEARCH IN ORNITHOLOGY
Aaron M. Bagg and Gustav A. Swanson 62

THE PRESIDENT'S PAGE

This copy of *The Wilson Bulletin* should reach you in March, but, publisher's deadlines being what they are, the President's Page is being written on the first day of the new year. Time and occasion make it proper that we look at what is ahead for The Wilson Ornithological Club.

Our next major event is, of course, the Thirty-second Annual Meeting at Davenport, Iowa, on April 26–29. Only once before, in 1929, has the Club met in Iowa, the meeting of that year having been in Des Moines. Not since the Minneapolis meeting of 1940 has the Club assembled on the banks of the Mississippi. This year we return to the great central river of the continent, in good time to see some of the spectacular migration along the Mississippi flyway. A full program of outstanding papers, social events, and field trips is already assured.

Plans for the 1952 meeting are well advanced. Subject to ratification by the Club, this will be in late April at Gatlinburg, Tennessee, the gateway to Great Smoky Mountains National Park. The Gatlinburg meeting should have many of the informal features which were afforded at Jackson's Mill, West Virginia, in 1950. Certainly the Club will not have met in more attractive surroundings. Chuck-will's-widows and Sycamore Warblers nest near the Park entrance. On Clingman's Dome, more than 5000 feet above Gatlinburg, is the last southeastern extension of the alpine spruce-fir forest, with its Olive-sided Flycatchers, Brown Creepers, Golden-crowned Kinglets, and Winter Wrens. Visitors will live with the unbroken sweep of Mt. Leconte, 6500 feet high, directly before them.

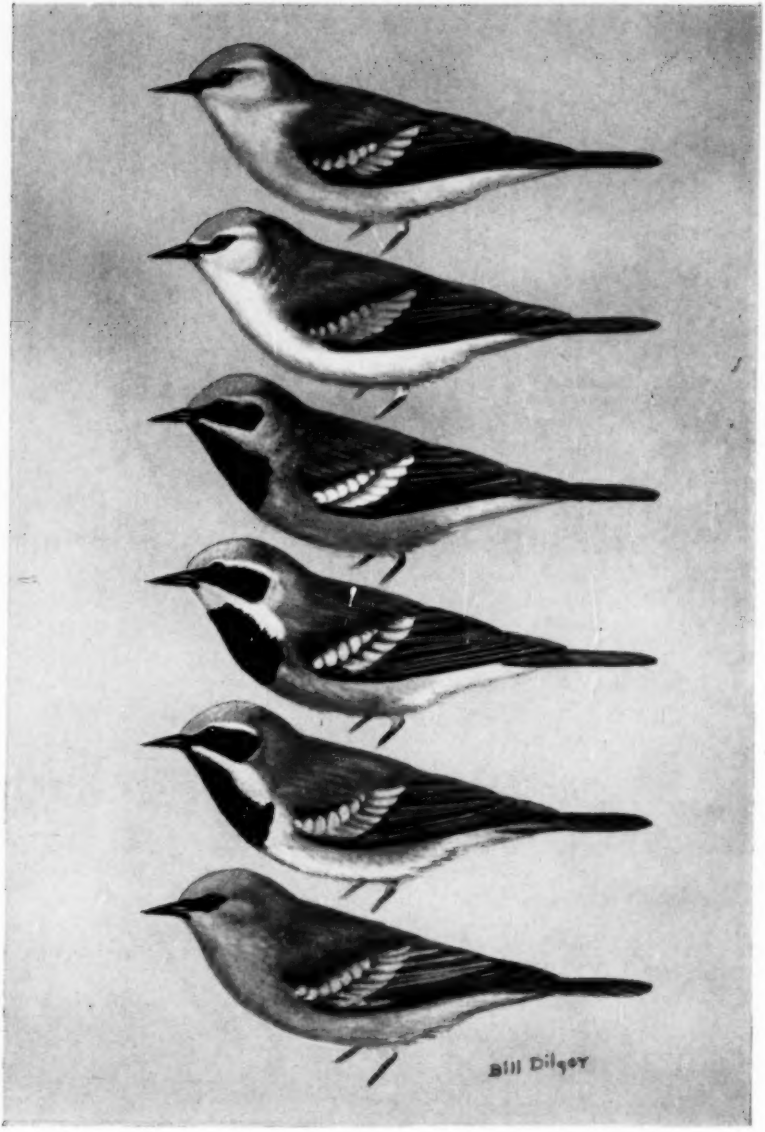
Once again many of our younger members are, or soon will be, in the armed services. Older Club members have the opportunity to repeat, and to expand, a service which was so much appreciated by members in service during World War II. Many a man in uniform found pleasure and profit in his free time because some bird student nearby offered guidance and transportation in acquainting him with local ornithology. If you are in a training center in this country, your officers urge that you use the Club's facilities for getting in touch with nearby field students. We will gladly give you names and addresses of members who may be in your vicinity.

During World War II it was a constant surprise, and a source of gratification, that so many members in service asked that their copies of the *Bulletin* be sent to the far corners of the earth where our forces were engaged. *The Wilson Bulletin* was a tie with home, and a symbol of more normal times and interests. Once more we offer this small service to members in uniform. No matter how often your address may change, we shall try to see that the continuity of your interest in the Club is unbroken.

The Wilson Bulletin is, of course, the Club's lifeline. The Editor is always happy to receive articles and notes of general interest, as well as attractive and scientifically significant illustrative material. For lack of funds there awaits reproduction in our pages a magnificent kodachrome by Hal H. Harrison of a Wilson's Warbler at its nest. Perhaps you would like to contribute to the publication in color of this highly appropriate subject.

In keeping with the season as this is written, your President wishes for all of you a busy and productive New Year.

MAURICE BROOKS



MALE HYBRID WARBLERS OF THE GENUS *VERMIVORA*
(For explanation see footnote on opposite page)
Painting by William C. Dilger

THE GENETICS OF THE GOLDEN-WINGED × BLUE-WINGED WARBLER COMPLEX

BY KENNETH C. PARKES[1]

PERHAPS the best known and most thoroughly documented case of hybridization between species of wild birds, at least in the North American avifauna, is that of the Golden-winged Warbler (*Vermivora chrysoptera*) and Blue-winged Warbler (*V. pinus*). These two species seem to hybridize more or less freely wherever their ranges overlap, producing two general hybrid types which were originally named as species: the Brewster's Warbler ("*Vermivora leucobronchialis*") and the Lawrence's Warbler ("*V. lawrencei*"). Before the hybrid nature of these two types was thoroughly established, many theories were proposed to account for the interrelationships observed. Some of these theories seem fantastic to the modern student. Early field observations and the various theories were summarized and synthesized by Faxon in two excellent monographs (1911, 1913).

The purpose of this paper is to review briefly what is known of these hybrids, to discuss a commonly accepted genetic explanation for the observed inheritance of characters, and to point out what shortcomings remain in our knowledge of their interrelationships. Original observations on the possible phenotypical detection of heterozygotes will also be presented.

The Parental Species

The Blue-winged and Golden-winged Warblers are neither strictly sympatric nor strictly allopatric. In general, the Blue-winged has the more southern breeding range, but there is a broad strip, roughly through southern New England, southern New York, New Jersey, Pennsylvania, Ohio, southern Michigan, northern Illinois and southern Minnesota, where the ranges of the two species overlap. It is in these areas, as would be expected, that the hybrids

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[1] The hybrid warblers shown in the color plate opposite are, from top to bottom:

F_1 Brewster's Warbler. Genotype WwSsPp. American Museum of Natural History specimen No. 380136. New Haven, Connecticut, May 17, 1892.

Back-cross Brewster's Warbler. Genotype WWSSPp. American Museum of Natural History specimen No. 392172. Bonilla, Costa Rica, September 27, 1920.

Lawrence's Warbler. Genotype wwsspp. American Museum of Natural History, L. C. Sanford collection No. 10846. Stratfield, Connecticut, May 19, 1917.

Heterozygous Golden-winged Warbler. Genotype WwSsPP. Chicago Natural History Museum No. 148778. New Haven, Connecticut, May 11, 1900.

Crossover-type Golden-winged Warbler. Genotype WWSspp. American Museum of Natural History No. 506277. Cumbre de Valencia, Venezuela, January 31, 1910.

Crossover-type Blue-winged Warbler. Genotype wwSsPP. American Museum of Natural History No. 380055. New Haven, Connecticut, May 17, 1893.

are found most commonly. In a number of outlying areas, either the Blue-winged or the Golden-winged is found only as an intruder, often recent, into the range of the other species. In such areas, the hybrids are quite sporadic (see Parkes, 1949, for a summary of such a situation in central and western New York). On the other hand, in certain areas where the parents are almost equally common, the hybrids are frequently observed. This is especially true of the area around southern New York, Connecticut and northern New Jersey. Most of the hybrid specimens I have examined are from this general area.

There is a small amount of ecological distinction between these two species in the areas where their ranges overlap, but the ecological preferences seem to overlap just as do the ranges. In general, the Golden-winged Warbler prefers the higher and more wooded portions of slopes, the Blue-winged the lower and more open. There is much local variation, occasionally even a reversal of the usual situation. Both species commonly live "in clearings, at the edge of the forest, and in abandoned fields, and it is probable that the hybridization is of recent date and caused by man-made habitat disturbances" (Mayr, 1942: 262). The theory of recent origin of the hybridization, whether or not assisted by man, is given added support by the fact that, although the region where the hybrids are now most frequent was one of the earliest to be studied, faunally, in the United States, the Lawrence's and Brewster's Warblers were not described until 1874. A few earlier specimens have since turned up in old collections.

The suggestion that *Vermivora chrysoptera* and *V. pinus* be considered conspecific has received little modern support, even among the most ardent of "lumping" taxonomists. The two parental types are too distinct to warrant such a step, and Mayr (*loc. cit.*) has called our attention to the fact that "hybridization has not led to a blurring of the border between the two species."

The Blue-winged and Golden-winged Warblers differ in three readily perceptible major color characters. These are (1) the ground color of the body (especially as regards the white or yellow of the underparts), (2) the presence or absence of a black throat-patch, and (3) the number and color of the wing-bars. Genetic speculation seems hitherto to have been limited to the first two of these; all three will be discussed in this paper.

Mating Behavior of Hybrids

It has long been known that the hybrids were fertile, and the literature abounds with breeding records for both the Brewster's and Lawrence's Warblers. There is an unusual phenomenon connected with the breeding of these hybrid types. In surveying published breeding records, one inevitably reaches the conclusion that the hybrids do not breed *inter se*, but only back-cross with birds that are at least phenotypically (that is, of the external appearance) of one of the parental types. Several authors have remarked upon the absence of records

of hybrid-hybrid matings (Faxon, 1911: 71–73). I have been able to locate but two published references to matings in which both of the parents are stated to have been hybrids. Sutton (1928: 206) recorded a nest found on June 6, 1922, near Hartstown, Pennsylvania, containing three heavily incubated eggs and two young birds. The supposed parent birds were taken, and were mailed to Sutton in the flesh by the collector, John G. Thomas. Both were of the Brewster's Warbler type. The male had an immaculately white breast, while the underparts of the female were strongly washed with yellow. Unfortunately these specimens were not preserved.

Hicks (1929: 44) recorded "a pair of typical Brewster's Warblers feeding young" in Hocking County, Ohio, on June 11–12, 1927. In his later list of Ohio birds (1935: 168), he modified this statement to read "Two Brewster's Warblers, *apparently* mated and feeding young . . ." (italics mine). Further data on this brood would undoubtedly have been gathered by Hicks had he realized the unique nature of the observation.

These appear to be the only recorded matings between hybrid warblers. While neither record is conclusive, each tends to weaken the concept that hybrids mate in back-crosses *only*. On the basis of presently available data, there certainly seems to be a marked *tendency* toward back-crosses. It must be acknowledged that over much of the range of the hybrids, availability of mates is the primary factor. In a region such as central New York, where the Golden-winged is the dominant species and the Blue-winged of purely fortuitous occurrence, a hybrid would be limited to Golden-winged Warblers in its choice of mates. However, in a well-studied area such as the lower Hudson Valley, where the hybrids are of regular occurrence (it has been said that they may occasionally outnumber the parental species locally), it would seem that hybrid-hybrid matings would have been recorded if no preferential factor or other reproductive barrier were in operation.

The best recent summary of extensive field observations of these warblers is that of Carter (1944). His studies would seem to indicate the presence of some preferential factor in mating, at least in this particular study area. A banded individual male Brewster's Warbler was observed for six successive years, and his mate and nest found in five of these years. Each year he mated with a female Golden-winged Warbler. Carter and his co-workers were of the opinion, based on banding and individual variation, that the female was a different individual each year. That female warblers other than Golden-winged were available as mates is indicated by the fact that in this small (about four acres) area in Passaic County, New Jersey, during this six-year study, observations were made of the following: a male Lawrence's x female Golden-winged nesting, a male Blue-winged x female Golden-winged nesting, four additional Brewster's Warblers, and two additional Lawrence's Warblers. Young birds were raised successfully in all of the nestings observed, and certain birds

banded as nestlings returned to the same area in subsequent years. Phenotypically, some of these young birds were certainly hybrids. Therefore there would seem to have been in the neighborhood an ample supply of hybrid birds from which the male Brewster's Warbler might have selected a mate. He did not do so, however, nor were any of the other hybrids in the study area known to have taken hybrid mates.

Although Carter's observations are, to my knowledge, the only published records showing the mating behavior of an individual hybrid *Vermivora* over a number of years, there are a number of instances from within single breeding seasons which support the thesis that hybrids do not mate with hybrids even when such mates are available. Faxon, for instance, described (1913: 311) the situation in 1910 in a swamp near Lexington, Massachusetts. The *Vermivora* population here consisted of a mated pair of Golden-winged Warblers; two female Brewster's Warblers, each mated to a male Golden-winged; and a male Brewster's Warbler which remained unmated throughout the season. (It is, of course, impossible to say *why* the male Brewster's Warbler was not paired with one of the female hybrids.) Since there were four male warblers and only three females in the area, one of the males must obviously have been forced to remain unmated. Possibly chance dictated that the unmated male should be the Brewster's; however, observations of situations of this sort are frequent enough to warrant the discounting of chance as the only factor involved.

It has been suggested that hybrid males may remain unmated because of a low adaptability in competing for mates. Male Brewster's Warblers are, however, frequently found mated to female Golden-winged Warblers in Golden-winged country where plenty of male Golden-winged competition exists.

Genetics of the Throat-patch

One of the major color differences between the Blue-winged and Golden-winged Warblers is the black throat-patch of the latter. Correlated with the presence of this patch is the broadening of the black transocular line of *pinus* into a black mask extending to the ear coverts in *chrysoptera*. This transocular mask I shall discuss later in this paper. The presence or absence of the throat-patch is believed to result from the action of a single gene.

The first use of letter symbols for the characters involved in these crosses seems to have been that of Nichols (1908). His notation has been employed by Faxon (1911: 73) and more recently by Pough (1946: 153). For the sake of convenience, therefore, Nichols' symbols will be used in the remainder of this paper. According to this notation, the allele for the dominant plain throat of the Blue-winged Warbler is assigned the symbol P. The black-throated condition, therefore, is represented by p. A homozygous ("pure" of many early authors) Blue-winged Warbler would carry the genes PP, and a homozygous Golden-winged Warbler pp. The first generation (F_1) hybrid, receiving a gene from either

parent, would have the heterozygous ("impure") genotype Pp. As P is dominant over p, this hybrid would have a plain throat.

Genetics of Underparts Color

The diagram given by Pough (*loc. cit.*) ascribes the presence or absence of the throat-patch and the white or yellow of the underparts to the action, respectively, of two single genes. In the case of throat-patch inheritance, this seems to be correct. Inheritance of underparts color, however, does not involve simple presence- or absence-characters such as those determining color of the throat-patch, as will be seen later. For purposes of preliminary explanation let us assume a single gene to control underparts color, of which the allele W (white) is dominant over the allele w (yellow). Thus the homozygous Golden-winged Warbler would have the genotype WWpp, since it has white underparts and a black throat-patch. Similarly, the Blue-winged Warbler, having yellow underparts and a plain throat, would have the genotype wwPP. The F_1 hybrid would have the genotype WwPp, the new combination of dominants thus giving us a white-breasted, plain-throated bird. This is obviously the hybrid type known as Brewster's Warbler.

The Origin of Lawrence's Warbler

Pough's diagram illustrates the theoretical Mendelian ratio in the F_2 generation resulting from crossing two F_1 Brewster's Warblers. Phenotypically, the expected ratio in the offspring of such crosses would be 9 Brewster's to 3 Golden-winged to 3 Blue-winged to 1 homozygous recessive (wwpp) bird. This last type would have yellow underparts and a black throat-patch: in other words, be a Lawrence's Warbler.

We have seen earlier that the Brewster's x Brewster's cross illustrated by Pough represents the exception in nature. I therefore undertook to compute the various means by which the double recessive, Lawrence's Warbler, might be recovered by crossing hybrids with birds of one or the other parental phenotype. There are a number of possible crosses by which this might be accomplished. In all cases it must be assumed that one or both parents, although phenotypically of one of the parental types, is actually heterozygous for one of the two characters here considered. The theoretical proportion of Lawrence's Warblers in the offspring of various crosses is shown below.

WwPp (F_1 Brew.) x wwPp (hetero. Blue-wing) WwPp (F_1 Brew.) x Wwpp (hetero. Golden-wing)	12.5% Lawrence's
Wwpp (hetero. Gold.-w.) x Wwpp (same) wwPp (hetero. Blue-w.) x wwPp (same) Wwpp (hetero. Gold.-w.) x wwPp (hetero. Blue-wing)	25% Lawrence's
wwpp (Lawrence) x Wwpp (hetero. Golden-wing) wwpp (Lawrence) x wwPp (hetero. Blue-wing)	50% Lawrence's

The relative frequencies in nature of the Brewster's and Lawrence's Warblers support the hypothesis that the latter hybrid represents the homozygous recessive. In the hybridization zone as a whole, the Lawrence's is much less common, although field observations in a limited area of heavy interbreeding may occasionally seem to reverse this proportion. In many localities, only the Brewster's hybrid has thus far been recorded. In the Buffalo, New York, region, for example, a small isolated population of Blue-winged Warblers and a larger population of Golden-winged Warblers have co-existed for many years. There have been a number of records of Brewster's Warbler from year to year, culminating in several breeding records in the past few years. With the subsequent recombination of characters, the appearance in this area of the double recessive Lawrence's Warbler was to be anticipated. This anticipation was realized in the spring of 1949, when the first Lawrence's Warbler was seen in the region.

What is the "Typical" Brewster's Warbler?

Throughout the ornithological literature one finds references to the "typical" Brewster's Warbler. Inevitably this adjective is applied to those Brewster's Warblers whose underparts are immaculately white, without a trace of yellow (Faxon, 1911: 58; Forbush, 1929: 214; Chapman, 1932: 449; Todd, 1940: 495; Peterson, 1947: 188; etc.). The specific epithet *"leucobronchialis"* may in part be responsible for this concept of a white-breasted bird as the 'typical' Brewster's Warbler. In the manuals mention is usually made of the variation in the color of the underparts, as a large proportion of the individuals, instead of being immaculately white beneath, are quite yellowish. Usually this 'variation' is dismissed by calling such birds "individual variants", "intermediates", or "intergrades" with *Vermivora pinus*, or by employing the obsolete genetical term "blending inheritance." With the possibility in mind of finding a genetic theory to account for these yellowish-breasted individuals, I examined 46 specimens of Brewster's Warbler (as well as specimens of the other pertinent forms of *Vermivora*) in the collections of the Chicago Natural History Museum, the American Museum of Natural History, the University of Michigan Museum of Zoology, and the Fuertes Memorial Collection at Cornell University.

It is my belief that the allele W for white underparts is incompletely dominant over the allele w for yellow. Birds which are heterozygous (Ww) for underparts color, therefore, are *basically* white but actually partially yellow. All F_1 Brewster's Warblers resulting from the mating of homozygous Blue-winged (ww) and Golden-winged (WW) parents are of this heterozygous type, the complete genotype of which is WwPp. This genotype may also be recovered in the offspring of a number of other crosses.

According to this theory, Brewster's Warblers with immaculate white underparts must be homozygous for this character, and thus have the genotype WWPp. One cross by which such a genotype may be obtained is that of an F_1

Brewster's Warbler (WwPp) and a homozygous Golden-winged Warbler (WWpp). As we have seen earlier, this is a frequently observed mating in regions of hybridization. One fourth of the offspring of such a cross would be expected to be of the homozygous white-breasted Brewster's type (WWPp). One fourth would be heterozygous yellowish-breasted Brewster's similar to the F_1 (WwPp). One fourth would be homozygous Golden-winged Warblers like the parent (WWpp), and one fourth would be heterozygous Golden-winged Warblers (Wwpp).

Plotting the expected offspring of all possible crosses, and bearing in mind that the initial interspecific cross would be expected to occur most frequently (in the range of the birds as a whole), we find that the yellowish-breasted individuals should outnumber the white-breasted ones by a substantial margin. This is supported by published field observations, and by museum specimens examined, of which 9 were white-breasted and 37 more or less yellow-breasted.

It follows, therefore, that the typical Brewster's Warbler, if by "typical" we mean the first generation offspring of a Blue-winged and a Golden-winged Warbler, has underparts with a definite yellowish tinge. The white-breasted form represents the offspring of a later cross, usually between an F_1 Brewster's and a Golden-winged Warbler.

The Heterozygous Parental Types

If, as postulated above, the allele W for white underparts is incompletely dominant, we should be able to detect the heterozygous (Wwpp) Golden-winged Warblers, for we would expect their underparts below the throat-patch to have a yellowish tinge. In a given museum series of Golden-winged Warblers, only a small number of such individuals would be expected, for two reasons: (1) most specimens usually come from within that part of the range of the species where no opportunity for hybridization exists, and (2) such heterozygotes cannot appear until the second or later hybrid generations. However, at least seven specimens examined fall readily into this category (reference specimens: ♂ CNHM 148778, 148785. ♀ CNHM 148779, AMNH 55041). Carter (1944) mentioned field observations of several individuals of this type in his study area of heavy hybridization. It should be mentioned here that in the normal first winter plumage of *Vermivora chrysoptera* the white underparts are often washed with yellow. However, as will be shown later, these birds can usually be separated from the heterozygotes by the condition of the wing-bars. Spring specimens showing yellow on the underparts are almost certainly heterozygotes.

The genotype of a heterozygous Blue-winged Warbler would be wwPp. Since the allele P for plain throat is believed to be completely dominant over p, it follows that the heterozygous Blue-wings would be externally indistinguishable from the homozygotes. I have never examined nor heard of a specimen of

Brewster's Warbler or Blue-winged Warbler with a faint or partial throat-patch, as might possibly be expected in those individuals heterozygous for the throat-patch character. Specimens of Golden-winged and Lawrence's Warblers in which the throat-patch does not extend as far as the chin represent, not heterozygotes for the throat-patch character, but (according to Dwight, 1900:247) first-year birds. Faxon's field observations of young birds (1911: 66) confirm this point.

The Wing-bars

There is a correlation, hitherto apparently unrecorded, between the color of the underparts and the color of the wing-bars, a correlation which leads me to believe that these two characters are probably rather closely linked in a genetical sense: that the genes determining them are on the same chromosome. The pure white condition of the underparts seems to be linked with the single, broad, pure yellow wing-bar of the Golden-winged Warbler. Yellow underparts, similarly, are linked with the two white wing-bars of the Blue-winged Warbler. Brewster's Warblers with yellowish on the underparts show a definite tendency toward the latter type of wing-bars. Apparently the gene for wing-bars is not only linked with that for underparts color, but exhibits the same sort of behavior in inheritance in that one allele is incompletely dominant over the other. I shall designate the dominant allele for single yellow wing-bar as S; the allele for double white wing-bar is therefore s. Just as the underparts color allele W is incompletely dominant over w, so S is incompletely dominant over s. The F_1 Brewster's Warbler, with the heterozygous wing-bar genotype Ss, has wing-bars intermediate between those of the parent species. This intermediacy is usually manifested by doubleness and whiteness of wing-bar, but the distinctly yellow tips and edges of the white areas of the feathers involved create the gross appearance of two pale yellow wing-bars. Since I have postulated that underparts color and wing-bar color are linked, a bird which is heterozygous for one of these characters would also be heterozygous for the other. It would be expected, therefore, that the heterozygous Golden-winged Warblers described earlier would have intermediate wing-bars, and such is indeed the case.

The wing-bars of the Blue-winged Warbler, being linked with the recessive yellow underparts, should theoretically be consistent. Occasionally, however, a specimen of this species is found to have yellowish wing-bars (reference specimen AMNH 95449). There is a simple genetic explanation for this. Such a bird may have had as one parent a Brewster's Warbler in whose underparts and wing-bar chromosome a crossover had taken place. If the other parent had been a normal Blue-winged Warbler, the result would have been a bird with the total genotype wwSsPP: in other words, a Blue-winged Warbler with intermediate wing-bars as described above.

Such a crossover can also readily account for other very rare combinations

which may appear. AMNH 506277, for example, is a typical male Golden-winged Warbler except that its wing-bars are of the intermediate type. Such a bird could be the offspring of a crossover Brewster's Warbler (like that described above) and a normal Golden-winged Warbler, and would have the genotype WWSspp.

Obviously only a small proportion of all Blue-winged or Golden-winged Warblers is of mixed ancestry, so the proportion of individuals with intermediate wing-bars in a series of either parent from all over the range of the species is small. On the other hand, *all* Lawrence's Warblers are obviously of mixed descent, so that a higher proportion of crossover types should be found in a series of these hybrids. My observations confirm this: of 17 Lawrence's Warblers examined, 13 had the normally expected Blue-winged Warbler type of wing-bar, and 4 were intermediate, indicating a crossover parent (or earlier ancestor).

Genetic Problems for Future Study

Although I believe the genetic theories outlined in this paper to be basically correct, some of them are admittedly oversimple. This is especially true of that concerning the inheritance of white versus yellow underparts. The *presence* or *absence* of yellow seems to follow the pattern of inheritance described quite closely. As yet, however, no hypothesis has been worked out to account for the great variation which exists in the *extent* of this yellow, both in Brewster's Warblers and in heterozygous Golden-winged Warblers (of which CNHM 148778 probably represents the extreme development). This is probably a matter of quantitative inheritance based on the interaction of several genes, the exact number of which will perhaps never be known.

Another variation of which the genetic basis is uncertain is that of the transocular black line. In occasional specimens of Brewster's Warbler (reference specimen UMMZ 73519) this normally thin line is expanded until it approaches the width of the black auricular patch normally present in the Golden-winged Warbler. Another case of linkage may be involved here, with one gene controlling the presence or absence of the throat-patch and the other the presence or absence of the transocular line enlargement. Brewster's and Blue-winged Warblers with expanded black transocular lines are so rare, however, that linkage must be particularly close, and crossovers consequently highly infrequent.

Correlation Between Genetic Theory and Field Work

There is great need for intensive field work in areas of heavy hybridization. Parent birds and their offspring should be color-banded and followed through successive seasons. Very few cases in which the parentage of a hybrid brood was unequivocally known and the brood followed through the post-juvenal

molt have been reported. The correlation between juvenal and later plumages is poorly known, and my own experience (Parkes, 1949) as well as that of Faxon (1911, 1913) and Nichols (in Carter, 1944) indicates that accurate prediction as to the type of plumage into which a given juvenal will molt is probably impossible.

The few cases of young birds of known parentage which have come to my attention all fit the basic genetic theories outlined in this paper. Faxon's 1911 paper summarized all such cases reported to that date, and his interpretations were essentially correct in the light of what was known at that time. He quoted one case (p. 69) reported by Beebe (1904) in which a male *lawrencei* was mated with a female *pinus*. All six of the offspring were described by Beebe as being typical *pinus*. Faxon could not understand why these young birds were identified as *pinus* rather than *lawrencei*. Beebe was correct, however, as according to the theories outlined here, the offspring of a mating between *lawrencei* and homozygous *pinus* should be phenotypically 100% *pinus*.

Summary

The Blue-winged Warbler (*Vermivora pinus*) and the Golden-winged Warbler (*V. chrysoptera*) hybridize over an extensive area of eastern North America where their respective ranges overlap, producing two general hybrid types. The commoner, Brewster's Warbler, is considered to be the F_1 offspring of the original interspecific cross. The rarer, Lawrence's Warbler, is considered to represent the combination of recessive characters. Two records are cited of supposed matings between Brewster's Warblers, but evidence is presented to indicate that back-crosses to a parental phenotype are the rule, and hybrid-hybrid crosses a rare exception, even when opportunity for such matings is present. The modes of inheritance for the throat and underparts colors are presented. The rare Lawrence's Warbler (recessive) type may be recovered by a number of possible crosses other than inter-hybrid matings.

Brewster's Warblers with yellowish underparts are considered to be mostly F_1 hybrids (plus the offspring of certain later crosses), while those with white underparts are back-crosses to the Golden-winged parent species. The allele for white underparts is considered incompletely dominant over that for yellow underparts. Heterozygous Golden-winged Warblers may be detected by this means. Chromosomal linkage is postulated for the genes determining underparts color and wing-bar type. Occasional variants from the expected character combinations are ascribed to a simple crossover. Other problems in the genetics of these birds are indicated, and the importance of field work in their study is emphasized.

Acknowledgements

Specimens were examined from the collections of the Chicago Natural History Museum, American Museum of Natural History, and Museum of Zoology,

University of Michigan, through the courtesy of the curators of the respective institutions. Mr. Eric C. Kinsey furnished valuable advice about the rearing of warblers in captivity. The manuscript has been critically read by the following: Dean Amadon, Andrew J. Berger, Robert T. Clausen, Daniel Marien, Ernst Mayr, H. H. Smith and George M. Sutton. Their various comments and suggestions have been most gratefully received.

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FOOD OF YOUNG RAPTORS ON THE EDWIN S. GEORGE RESERVE

BY F. N. HAMERSTROM, JR. AND FRANCES HAMERSTROM

DURING the nesting seasons of 1941, 1942, and 1946 we studied the food of several young Cooper's Hawks (*Accipiter cooperii*) following Errington's (1932) method of squeezing stored food from the gullet. Our work began while the birds were still in the nest. We continued it by tethering the hawks on the ground during a period in which they would normally have been flying. We attached a jess to each tarsus, fastening the two jesses with swivels to one short chain, thus obviating trouble with broken legs. In 1946 we studied also the food of two young Red-tailed Hawks (*Buteo jamaicensis*) and one young Barred Owl (*Strix varia*), again tethering the birds on the ground.

We did this work on the Edwin S. George Reserve, a tract of about 1300 acres of former farm land in southwestern Livingston County, Michigan. It is owned by the University of Michigan and administered by the Museum of Zoology as a field study area. The terrain is rough and morainic. Present cover types are about as follows: "26 per cent mixed hardwoods (mainly *Quercus-Carya*), 11 per cent tamarack (*Larix laricina*) swamp, 6 per cent brush, largely around the margins of swamps and bogs, 4 per cent bog, 7 per cent marsh, and 46 per cent grassland" (O'Roke and Hamerstrom, 1948).

The area ordinarily supports from three to six breeding pairs of raptors including, in varying combinations, the following: Turkey Vulture (*Cathartes aura*), Cooper's Hawk, Red-tailed Hawk, Marsh Hawk (*Circus cyaneus*), Great Horned Owl (*Bubo virginianus*), Barred Owl, and Long-eared Owl (*Asio otus*). Some of these—notably the Turkey Vulture and Long-eared Owl—have nested much less often than the others. The Cooper's Hawk is one of the most regular nesters. Our data concerning this species we obtained from four broods—two in 1941, one in 1942, and one in 1946. Two of the nests (Nos. 1 and 3) were found by Dr. Arthur E. Staebler.

The general plan was to visit the nests or tethered young once or twice daily. When we could identify the gullet contents on the spot, we returned the food at once. In most cases, however, we had to take diagnostic portions to the Museum of Zoology for comparison with reference collections there. Several members of the staff helped with the more difficult identifications, especially Drs. Pierce Brodkorb, George M. Sutton, Josselyn Van Tyne, William H. Burt, and Emmet T. Hooper. We found additional evidence of what the hawks were eating in such debris as bones and feathers, and in items of prey which had not been eaten. Most of the nest-trees were easy to climb, but one (Nest 2) required a little engineering since we did not want to scuff the bark by daily use of climb-

FIG. 1. Young Cooper's Hawk tethered on ground near nest. Photographed at the Edwin S. George Reserve, near Pinckney, Michigan, on July 15, 1946, by Alfred E. Brandt and George M. Sutton.

ing irons. When the four nestlings were about two weeks old we fastened a shallow basket, about 18 inches in diameter, to a rope which passed through a pulley high in the tree. The pulley was hung from a coil spring to keep the rope

from breaking when the trees swayed in the wind, and to keep enough tension on the rope to prevent the basket from swinging. We transferred the nestlings to the basket, which was suspended about 10 feet below the nest, and knocked the nest from the tree. The adults accepted the new "nest" immediately and even decorated it with a few juniper twigs. With this apparatus we could bring the young to the ground whenever we wished.

When the young were about ready to become "branchers"—i.e., to climb about the nest-tree—we tethered them on the ground until the adults began to lose interest in feeding them. When the young received so little from the parents that further study was not worth-while, we turned them loose. One free-flying brood we helped to feed for several days while they became accustomed to their new way of life.

We were unable to identify most of the food items which we took from the gullets of the nestlings during the first 10 days or so of their lives, as the material consisted for the most part of small scraps of meat with little or no fur, feathers, or bone attached. After they began to eat larger pieces of prey it became progressively easier to identify the food. Over the three seasons we examined the broods of young hawks a total of 189 times. We found no newly-brought-in items of prey on 25 of these visits. The food recovered from the young (gullet contents, debris, and uneaten prey) was as follows:

Nest 1, *June 10-July 24, 1941.* Birds: Ruffed Grouse (*Bonasa umbellus*), 1 ad.; Bob-white (*Colinus virginianus*) (?), 1 imm.; Ring-necked Pheasant (*Phasianus colchicus*), 8 imm.; Killdeer (*Charadrius vociferus*), 1 age ?; Mourning Dove (*Zenaidura macroura*), 3 ad., 2 imm., 3 nestl.; Yellow-billed Cuckoo (*Coccyzus americanus*), 1 ad.; Flicker (*Colaptes auratus*), 2 imm., 1 age ?; Hairy Woodpecker (*Dendrocopos villosus*), 1 ad.; Downy Woodpecker (*Dendrocopos pubescens*), 2 imm.; Phoebe (*Sayornis phoebe*) (?), 1 age ?; Bank Swallow (*Riparia riparia*), 1 imm.; Blue Jay (*Cyanocitta cristata*), 2 ad., 3 imm., 2 nestl., 1 age ?; White-breasted Nuthatch (*Sitta carolinensis*), 1 age ?; White-breasted Nuthatch (?), 1 age ?; Robin (*Turdus migratorius*), 8 imm.; Cedar Waxwing (*Bombycilla cedrorum*), 1 imm., 1 age ?; Starling (*Sturnus vulgaris*), 1 ad., 6 imm., 1 age ?; Starling (?), 2 age ?; English Sparrow (*Passer domesticus*), 4 ad., 4 imm., 4 age ?; English Sparrow (?), 1 imm., 1 age ?; Red-wing (*Agelaius phoeniceus*), 1 ad., 2 imm., 3 age ?; Baltimore Oriole (*Icterus galbula*), 2 ad., 1 age ?; Grackle (*Quiscalus quiscula*), 1 imm.; Cowbird (*Molothrus ater*), 2 imm.; Vesper Sparrow (*Pooecetes gramineus*), 2 age ?; Vesper Sparrow (?), 1 age ?; unidentified birds, 3 imm., 2 nestl., 4 age ?. Total Birds: 16 ad., 47 imm., 7 nestl., 26 age ?.

Mammals: Eastern Chipmunk (*Tamias striatus*), 2 ad., 2 imm., 4 age ?; Red Squirrel (*Tamiasciurus hudsonicus*), 1 age ?; Gray Squirrel (*Sciurus carolinensis*), 1 imm., 1 age ?. Total Mammals: 2 ad., 3 imm., 6 age ?.

Nest 2, *June 8-24, 1941.* Birds: Ruffed Grouse, 2 imm.; Ring-necked Pheasant, 3 imm.; Mourning Dove (?), 1 nestl.; Yellow-billed Cuckoo, 1 ad.; Screech Owl (*Otus asio*), 1 ad.; Flicker, 3 ad., 2 imm., 2 age ?; Purple Martin (*Progne subis*), 1 ad.; Blue Jay, 1 ad., 2 imm., 3 nestl., 1 age ?; Catbird (*Dumetella carolinensis*), 1 imm., 1 age ?; Robin, 1 imm.; Robin (?), 1 age ?; Cedar Waxwing, 1 imm.; Cedar Waxwing (?), 1 imm., 1 nestl.; Starling, 2 imm.; English Sparrow, 1 ad., 3 imm., 4 age ?; Red-wing, 2 ad., 2 imm., 1 age ?; Baltimore Oriole, 1 imm., 1 age ?; Cowbird, 1 imm.; Scarlet Tanager (*Piranga olivacea*), 2 age ?; Cardinal

(*Richmondena cardinalis*), 1 imm.; Towhee (*Pipilo erythrophthalmus*), 1 ad.; unidentified birds, 2 ad., 2 imm., 6 age ?. Total Birds: 13 ad., 25 imm., 5 nestl., 19 age ?.

Mammals: Striped Ground Squirrel (*Citellus tridecemlineatus*), 1 imm.; Eastern Chipmunk, 9 age ?; Red Squirrel, 1 imm.; Fox Squirrel (*Sciurus niger*), 1 imm.; Southern Flying Squirrel (*Glaucomys volans*), 1 imm.; Cottontail (*Sylvilagus floridanus*), 1 imm.; unidentified sciurid, 1 imm. Total Mammals: 6 imm., 9 age ?.

Nest 3, *June 23–July 2, 1942.* Birds: Ruffed Grouse, 1 ad.; Ring-necked Pheasant, 1 ad.; Mourning Dove, 1 ad., 2 imm.; Flicker, 1 imm.; Hairy Woodpecker, 1 ad.; Eastern Kingbird (*Tyrannus tyrannus*), 1 imm.; Cedar Waxwing, 1 imm.; Starling, 1 ad., 1 imm.; English Sparrow, 1 imm., 3 age ?; Red-wing, 2 imm., 1 age ?; Baltimore Oriole, 2 age ?; unidentified birds, 2 age ?. Total Birds: 5 ad., 9 imm., 8 age ?.

Mammals: Striped Ground Squirrel, 1 age ?; Eastern Chipmunk, 2 age ?; Bog Lemming (*Synaptomys cooperi*), 1 age ?; Meadow Jumping Mouse (*Zapus hudsonius*), 1 age ?. Total Mammals: 5 age ?.

Nest 4, *June 14–July 19, 1946.* Birds: Flicker, 3 imm., 1 age ?; Hairy Woodpecker, 1 age ?; Blue Jay, 1 imm.; Catbird, 1 imm.; Robin, 1 age ?; Robin (?), 1 imm.; Wood Thrush (*Hylocichla mustelina*) (?), 1 nestl.; Cedar Waxwing, 1 age ?; Starling, 4 imm.; Yellow-throated Vireo (*Vireo flavifrons*), 1 ad.; English Sparrow, 1 ad.; English Sparrow (?), 1 age ?; Meadowlark (*Sturnella magna*), 1 ad., 2 imm., 1 age ?; Red-wing, 1 ad., 2 imm., 2 age ?; Red-wing (?), 1 imm.; Baltimore Oriole, 2 imm.; Cowbird, 1 imm.; Scarlet Tanager, 1 ad.; Cardinal, 1 imm.; Vesper Sparrow (?), 1 imm.; Song Sparrow (*Melospiza melodia*), 1 imm.; unidentified birds, 1 imm., 5 age ?. Total Birds: 5 ad., 22 imm., 1 nestl., 13 age ?.

Mammals: Prairie Mole (*Scalopus aquaticus*), 1 age ?; Eastern Chipmunk, 1 ad., 2 imm., 2 age ?; unidentified sciurids, 3 age ?; unidentified mouse, 1 age ?. Total Mammals: 1 ad., 2 imm., 7 age ?.

Near three of the nests there were one or two "plucking trees" in which the adult hawks repeatedly dressed out their kills. Since we do not know how much of this prey they ate themselves and how much they fed to the young, we have not included any of it in the food list above. Many prey species occurred both in the food recovered from the young hawks and in the debris under plucking trees. In some cases we could be sure that these represented different individuals because they appeared at different times. There were three bird species that we found only among the plucking tree debris, never among the foods of the young hawks. Altogether, there were at least 21 plucking tree items representing kills not listed above. These items were (where age is not stated, it is not known): Ruffed Grouse, 1; Mourning Dove, 2 ad.; Flicker, 1 ad.; Purple Martin, 1; Tufted Titmouse (*Parus bicolor*), 1; Catbird, 1; Brown Thrasher (*Toxostoma rufum*), 1; Starling, 2 imm.; English Sparrow, 1 imm. and 1 age ?; Baltimore Oriole, 1; Cowbird, 2 ad.; Scarlet Tanager, 1 ad. male; Rose-breasted Grosbeak (*Pheucticus ludovicianus*), 2 imm.; Towhee, 1 ad. male; and Cottontail, 2 imm.

Of the 262 individual prey items among the foods of the young hawks, 84.4 per cent were small to medium-sized birds, and 15.6 per cent were small mammals. The largest items of prey were these: Ring-necked Pheasant, 1 ad. female; Ruffed Grouse, 2 ad.; Fox Squirrel, 1 imm.; and Cottontail, 1 imm. (and 2 more among the plucking tree debris).

In general, the food list is much the same as that which has been found in other studies elsewhere (see, for example, Fisher, 1893; Hausman, 1928; Snyder, 1932; Errington, 1933; McAtee, 1935; May, 1935; Edge and Lumley, 1940; and McDowell, 1941). A conspicuous difference between our study and those of others is that we found no domestic poultry or pigeons. Insects, amphibians, and reptiles in small numbers have been reported in other studies, and in one unusual instance (Fitch *et al.*, 1946) lizards formed the greater part of the diet. We found only birds and mammals. It is possible that certain kinds of prey, or certain size classes, were not brought to the nestlings. This is another reason for listing the plucking tree material separately. Segregating the data in this way should make possible a more precise comparison of different studies.

Although predation often falls heavily upon the immature, our food list does not show such a trend. Of 155 birds whose age we could determine, 25.1 per cent were adults, while 74.9 per cent were immatures. At least 8.4 per cent were nestlings. On the basis of 14 of the mammals, a similar age ratio occurred: adults, 21.4 per cent; immatures, 78.6 per cent. These immature:adult ratios are about what one would expect to find in prey populations at this time of year.

Nine bird species and one mammal species make up 73.7 per cent of the 213 completely identified items in the food list, although the total list is composed of 30 to 33 species of birds and 10 of mammals. In order of their occurrence as prey, the 10 species fed most often to the young hawks were: English Sparrow, Chipmunk, Red-wing, Starling, Blue Jay, Flicker, Ring-necked Pheasant, Mourning Dove, Robin, and Baltimore Oriole. Six of these were found at all four nests: English Sparrow, Chipmunk, Red-wing, Starling, Flicker, and oriole. Probably others would have been added to these six if Nest 3 had been under observation for a longer time.

At the three nests with the longest span of data (1, 2, and 4), most of the 10 major prey species were taken essentially throughout the period of most intensive study, i.e., the last half of June through all but the last week of July. Up to July 1, the species which were taken in greatest numbers at these three nests were the Chipmunk (12), Red-wing (7 + 1?), English Sparrow (7), Starling (5), Blue Jay (5), and Flicker (5). These were the most abundant species in the totals for the whole period. All of them except the Chipmunk were taken in even greater numbers in July, although no Blue Jays were found after July 14, no Flickers after July 18, and only one Red-wing after July 15. Two species, however, were distinctly more characteristic of July than of the whole period: (a) the 11 immature Pheasants were all taken between July 7 and 22 (the one adult hen, at Nest 3, on June 26); and (b) all of the Mourning Doves except one (plus 1?) were taken in July. Robins were taken somewhat more often in July than in June (7 + 1? vs. 3 + 1?), but this difference is not necessarily significant. Orioles, at the bottom of the list of the 10 most commonly eaten species, were scattered about equally through June and July.

The order of abundance of the prey species poses something of a problem, especially in the case of the birds. With the exception of the Red-wing, not one of the nine bird species most heavily preyed upon was among the most common breeders on the Reserve proper. The English Sparrow, Starling, and Pheasant were actually among the least common, while the Blue Jay, Flicker, dove, Robin, and oriole were no more than moderately common.

Conversely, the most abundant breeding species were not represented among the food items in numbers at all proportional to their occurrence. Dr. George Miksch Sutton, who has been studying the nesting birds of the Reserve for many years, has been kind enough to list for us the ten breeding species which he found to be commonest in the 1941–46 period. The first four are arranged in descending order, with the most common listed first; the rest are, he believes, certainly among the first ten, although they may not be listed in precisely their order of abundance: Field Sparrow (*Spizella pusilla*), Wood Pewee (*Contopus virens*), Goldfinch (*Spinus tristis*), Song Sparrow (*Melospiza melodia*), Red-wing, Yellow-throat (*Geothlypis trichas*), Oven-bird (*Seiurus aurocapillus*), Yellow-throated Vireo, Indigo Bunting (*Passerina cyanea*), and Least Flycatcher (*Empidonax minimus*). Of these, only the Red-wing was among the first ten food-species of the young hawks, and although it held second place among birds on the food list, it ranked no higher than fifth in order of abundance in the summer bird population. Only one other of the commonest summer residents—a single Yellow-throated Vireo—occurs on the food list at all. Most of the commonest summer birds were rather small, perhaps too small to be worth while to a Cooper's Hawk at all, or too small to be worth taking back to the nest—but a few were at least as large as the English Sparrow. All of them occurred in the kinds of habitat in which one or another of the major prey items were found.

The very fact that English Sparrows and Starlings were so large a part of the food total is plain evidence that these hawks did not confine their hunting to the Reserve. Both species lived in numbers around the farm buildings and cultivated lands *outside the boundary fence*. The closest places at which English Sparrows could be found in numbers were: from Nests 1 and 3, slightly over a half mile—immediately outside the fence; from Nests 2 and 4, about three quarters of a mile—a half mile beyond the fence, across pasture and cultivated land. Starlings were abundant at the English Sparrow concentrations nearest to Nests 1 and 3. In the case of Nests 2 and 4, Starlings were closer than the English Sparrows by almost half a mile. Only at Nest 4, however, does the Starling figure more prominently than the English Sparrow as an item of prey. At this nest only one English Sparrow was recorded (2.4 per cent of all birds recovered).

Both Uttendörfer (1939) and Tinbergen (1946) have commented upon a similar disproportionate occurrence of certain kinds of prey in the food of the closely related European Sparrow Hawk (*Accipiter nisus*). Both of these authors

emphasize the fact that *Accipiter nisus* hunts certain types of habitat more often than others, rather than all types at random. Uttendörfer points out that in Germany the Sparrow Hawk seldom hunts in the vicinity of its nest, but flies out some little distance instead. Tinbergen says that it hunts especially often those places in which prey species are most abundant. In Holland these places are most often around villages and cultivated fields, but when—as seldom happens—a woodland has a high population of small birds, the Sparrow Hawk hunts there more often than is usual in that type. Both authors make clear that this habit of hunting certain habitats or localities plays a large part in determining what species are caught. Uttendörfer further believes that some Sparrow Hawks show a preference for certain species of prey. Tinbergen (1946: 194), however, says: "But it is not necessary that there is a preference for the species as such. On the contrary, it is probable that a comparison of the food with the faunae of those places that are hunted over (so not of the whole domain) would show that the different species are represented proportionally." He points out that captures are not *strictly* proportional to abundance, for some species are more easily caught than others. He cites the House Sparrow (*Passer domesticus*) as one of the more vulnerable species. It is not only especially abundant in the habitat in which the Sparrow Hawk does most of its hunting, but it is also especially liable to be caught "as it often leaves cover, as it is always busily moving about and probably as it lives socially throughout the year" (p. 203). Birds which are especially conspicuous (brightly colored, noisy, singing or feeding in exposed places), which are slow flying, which often leave cover, and which occur in groups rather than singly, are apt to be caught in disproportionately large numbers. Those whose habits are the opposite—secretive, quick, etc.—are apt to be caught in disproportionately small numbers.

Tinbergen's analysis would seem to explain the apparent contradiction in our data. Even though our Cooper's Hawks did not prey most extensively on the birds that were most abundant on the Reserve itself (with the exception of the Red-wing), there were concentrations of English Sparrows and Starlings within easy reach of all four nests. Blue Jays, Flickers, Mourning Doves, Robins, and orioles did not live in great concentrations anywhere in the neighborhood, but they were all moderately common. All of these species characteristically leave cover and fly out into open stretches for considerable distances; they are perhaps more vulnerable for that reason than some other species which out-rank them in abundance. It seems significant that all the Pheasants were taken in 1941 and 1942, a time of relative abundance in the country surrounding the Reserve. Southern Michigan experienced the almost nation-wide Pheasant decline of the mid-forties, and we found no Pheasants among the Cooper's Hawk's foods in 1946.

Red-tailed Hawk and Barred Owl

Six pairs of raptors attempted to nest on the Reserve in 1946—two pairs

of Cooper's Hawks, two of Red-tails, one of Great Horned Owls, and one of Barred Owls. We hoped to make a comparative study of the food habits of all four species. However, the eggs in one Cooper's Hawk nest were destroyed during incubation, and if there was a second nest we did not find it. The Horned Owl nest had but one young, not yet able to fly, when it was found by Drs. Samuel Graham and E. C. O'Roke on April 22. Two days later the young owl was gone from the nest, and the adults abandoned the nesting woods shortly thereafter. We think the nestling was killed. The two Red-tail nests had but one young each. We obtained some food habits data from each of these broods, but one of the young was killed by a Horned Owl about three weeks after we had tethered it on the ground. The Barred Owl nest held two small young when we found it June 3, but one was gone by the next day. The young owl which disappeared was far too small to have left the nest in a normal manner. We tethered the remaining one; it was killed in late August, presumably by a Red-tail.

It is worth emphasizing that in this year of high nesting density—six pairs of raptors on 1300 acres—the success ratio was very low, quite apart from the disturbance caused by our studies. Both Red-tail broods numbered only one young each, and we did not climb to these nests until after the eggs had hatched. The Horned Owls were apparently wholly unsuccessful, and we did not climb that tree at all. The Barred Owls had only two young, one of which disappeared just after we had visited the nest once. The successful Cooper's Hawk nest had three young and one egg which failed to hatch, while all the eggs in the other nest were destroyed before we climbed to it.

As a matter of fact, it was fighting between the Barred Owls and the successful Cooper's Hawks that led us to that particular hawk nest (Nest 4). On the afternoon of May 14 we heard two adult Barred Owls calling, in rapid cadence, at a spot in the woods about a quarter of a mile away. Their calls were followed at once by the chatter of a Cooper's Hawk, apparently at the same place. Within a matter of seconds another Cooper's Hawk appeared over the tree-tops, flying rapidly toward the commotion. The flying hawk dove vertically, and was lost to view behind the crest of a ridge. Following the bearing given us by the stooping hawk, we walked directly to the nest. The commotion had died away before we got there, and the owls were gone, but there was still a very much excited Cooper's Hawk scolding near the nest. The Barred Owl nest, which we found about two weeks later, was only 200 yards away.

We have very little comparative material. We got 59 pellets and one uneaten prey item from the tethered young Barred Owl, over the period June 4 through August 28. A few pellets were probably broken and scattered before we found them, but as we gathered the pellets generally every three to five days, we probably got most of them. One young Red-tail was tethered from May 17 to June 6, the other from June 4 to July 12. We visited these hawks much less regularly than we did the Cooper's Hawks, and got from them only 27 items of prey.

The Barred Owl had eaten mainly mice (110), but 15 insectivores, 13 small birds, and 12 amphibians were represented. There were 18 beetles in the pellets. As the two genera of bettles which we could identify are known to be attracted to carrion, it is possible that the young owl caught them rather than receiving them from the adults. There were no crayfish (*Cambarus* sp.), although Barred Owls commonly eat them. Among the foods of the Red-tails, members of the Sciuridae made up almost half (13) of the total number of items. It is of interest that of the four birds recovered, three (Red-wing, Blue Jay, and Flicker) were among the most important foods of the young Cooper's Hawks. There was one weasel (*Mustela* sp.).

The Barred Owl and Red-tail data are as follows:

Barred Owl Nest, *June 4–August 28, 1946.* Birds: Hairy Woodpecker (?), 1 imm.; Crested Flycatcher (*Myiarchus crinitus*), 1 ad.; White-breasted Nuthatch, 1 age ?; unidentified birds, 2 ad., 4 imm., 4 age ?. Mammals: Prairie Mole, 1; Star-nosed Mole (*Condylura cristata*), 2; Shrew (*Sorex*, probably *S. cinereus*), 2; Short-tailed Shrew (*Blarina brevicauda*), 10; Eastern Chipmunk, 1; Southern Flying Squirrel, 3; White-footed Mouse (*Peromyscus* sp.), 66; Bog Lemming, 33; Meadow Vole (*Microtus pennsylvanicus*), 10; Meadow Jumping Mouse, 1; unidentified mammals, 1. Amphibians: 12 unidentified frogs and/or toads. Snakes: 1 unidentified. Insects: *Geotrupes* sp., 10; *Necrophorus* sp., 2; unidentified beetles, 6.

Red-tail Nests, *May 17–June 6 and June 4–July 12, 1946.* Birds: Sora (*Porzana carolina*), 1 age ?; Flicker, 1 ad.; Blue Jay, 1 age ?; Red-wing, 1 imm. Mammals: Prairie Mole, 1; Weasel (*Mustela*, probably *M. frenata*), 1; Striped Ground Squirrel, 1; Eastern Chipmunk, 3; Gray Squirrel, 3; Fox Squirrel, 6; Meadow Vole, 2; Pine Vole (*Pitymys pinetorum*), 1. Toad (*Bufo americanus*), 2. Snakes: Blue Racer (*Coluber constrictor*), 2; unidentified snake (probably Blue Racer), 1.

Summary

During three nesting seasons we identified the food brought by the parent birds to four broods of young Cooper's Hawks, to two young Red-tailed Hawks (two broods of one each), and to one young Barred Owl on the Edwin S. George Reserve, in southeastern Michigan. We used Errington's (1932) tethering technique.

Of a total of 262 Cooper's Hawk food items recovered from the gullets of the young hawks, as not yet eaten prey, or as residual debris in the nests or at the tethered young, 84.4 per cent were small to medium-sized birds and 15.6 per cent were small mammals. Of 155 birds whose age we could determine, 25.1 per cent were adult and 74.9 per cent immature. At least 8.4 per cent were nestlings. Of 14 comparable mammals, 21.4 per cent were adult and 78.6 per cent immature.

Nine bird and one mammal species constituted 73.7 per cent of the 213 completely identified food items brought to the young Cooper's Hawks, although the total list included 30 to 33 species of birds and 10 of mammals. The Chipmunk was the second most abundant item of prey. Three of the nine birds

(English Sparrow, Starling, and Red-wing) occurred locally in concentrations, although the first two were decidedly scarce on the Reserve itself. Five characteristically leave cover and fly out across the open (Blue Jay, Flicker, Mourning Dove, Robin, and Baltimore Oriole). All of these eight species were moderately common in the neighborhood, although only one (Red-wing) was among the most abundant of the Reserve's nesting birds. The ninth (Ring-necked Pheasant) was represented only in 1941 and 1942, a time of relative abundance in the farmlands surrounding the Reserve, and not at all in 1946, a time of scarcity.

The food brought the two young Red-tailed Hawks and one young Barred Owl was largely small mammals plus a few birds, amphibians, snakes and insects.

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THE COWBIRD AND CERTAIN HOST SPECIES IN MICHIGAN

BY ANDREW J. BERGER

ALTHOUGH attention has been directed recently to the problem of clutch size in the genus *Molothrus* (Davis, 1942; Preston, 1948; Nice, 1949), little has been written on the length of the breeding season of the best known species of the group, the Cowbird (*Molothrus ater*). Hann (1937: 206) tabulated dates on which he found Cowbird eggs in Oven-bird (*Seiurus aurocapillus*) nests over a three-year period in southern Michigan. His earliest date for a Cowbird egg was May 20, his latest July 6. Walkinshaw (1949: 83) presented data on 25 Cowbird eggs apparently laid by one female between May 15 and July 20 in southern Michigan. Norris (1947: 86) tabulated dates for Cowbird laying over a two-year period near Butler, Pennsylvania. The first eggs were laid on April 27 and April 10, the last on June 25 and July 12 in 1944 and 1945 respectively. In her study of the Song Sparrow (*Melospiza melodia*) in Ohio, Nice (1937: 155) found that the average date for the first Cowbird egg was April 25.

From April 1, 1946 through September 30, 1949 (except for the periods June 20 to September 1, 1946, and June 22 to August 15, 1947) I studied the Cowbird in Washtenaw County, Michigan. During these four breeding seasons I observed the nests[1] of 72 species of birds. Twenty of these were Cowbird-parasitized, and evidence pointed strongly toward parasitization of two additional species.

I knew to the exact one- or two-day period the laying date of 34 Cowbird eggs. Sufficient data were available on 119 additional eggs to permit my estimating the date of laying. Table 1 presents the laying dates of these 153 eggs.

Table 2, which follows the treatment of Norris (1947), indicates the degree of parasitism of the several host species and the success of the Cowbird eggs laid in these nests.

One obvious factor determining the degree of parasitism is the relationship of the Cowbird's breeding season to that of the host species. Pertinent data concerning the breeding season of certain host species and the relative success of parasitized and non-parasitized nests are given below. These data supplement those presented in Table 2.

[1]Several colleagues showed me nests they had found: David Delzell, three of the Phoebe (*Sayornis phoebe*); Charles C. Carpenter, three of the Song Sparrow and one of the Goldfinch (*Spinus tristis*); P. B. Hofslund, two (parasitized) of the Red-wing (*Agelaius phoeniceus*) and one each of the Song Sparrow and Yellow-breasted Chat (*Icteria virens*); N. S. Potter III, one of the chat; and H. B. Tordoff, one of the Field Sparrow (*Spizella pusilla*).

TABLE 1

COWBIRD EGG-LAYING DATES IN SOUTHERN MICHIGAN

	1946	1947	1948	1949		1946	1947	1948	1949
April 21	1				June 9				
22					10				
23					11				
24					12		1		
25				1	13				
26			1	2	14				2
27	2			2	15			1	2
28	1			4	16			1	1
29				4	17				1
30				3	18				
May 1	1		1	2	19				
2			1	2	20				
3			2	1	21				
4			2	1	22				
5	1		2	4	23				
6				4	24				
7				2	25				
8				2	26				
9					27				
10	1				28			1	1
11	1				29				
12			1	1	30				
13				2	July 1				
14			1	1	2			1	
15	1		1	3	3				
16		2	1	2	4				
17		4	2	2	5				
18	1	1		3	6				
19	1	3		1	7				
20	2	1	1	2	8				
21	2	1	1	2	9				
22	3	3	2		10				
23	1		1		11				
24			1		12				
25	1		3		13				
26	1	1	1		14				
27		1		1	15				
28					16				
29					17				
30		2	1		18				
31				1	19				
June 1			1		20				
2		1	4	2	21				
3		1	1	1	22				
4					23				
5					24				
6	1	1			25		1		
7	2	1			26				1
8		1		1	27				

TABLE 2

DEGREE OF PARASITISM AND COWBIRD SUCCESS

Species	Total nests	Parasitized nests	Nests with 1 Cowbird eggs	2	3	4	5	Cowbird eggs laid	Cowbird eggs hatched	Cowbird young fledged
Phoebe	15	5(33.3%)	3	1	1	—	—	8	5	5
Alder Flycatcher	37	3(8.1%)	2	1	—	—	—	4	1	1
Catbird	71	1(1.4%)	—	1	—	—	—	2	0	0
Wood Thrush	7	1(14.3%)	—	1	—	—	—	2	0	0
Red-eyed Vireo	1	1(100%)	—	—	—	1	—	4*	0	0
Oven-bird	2	2(100%)	—	1	1	—	—	5	0	0
Yellow Warbler	44	18(40.9%)	9	3	6	—	—	33	3	2
Yellow-throat	1	1(100%)	1	—	—	—	—	1	0	0
Yellow-breasted Chat	3	1(33.3%)	1	—	—	—	—	1	0	0
Red-wing	99	5(5.0%)	5	—	—	—	—	5	1	0
Cardinal	22	10(45.4%)	3	5	2	—	—	19	4	4
Rose breasted Grosbeak	2	1(50.0%)	1	—	—	—	—	1	0	0
Indigo Bunting	9	5(55.5%)	3	1	—	1	—	9	4	4
Goldfinch	70	2(2.8%)	1	—	1	—	—	4	0	0
Red-eyed Towhee	6	2(33.3%)	1	1	—	—	—	3	1	0
Vesper Sparrow	6	2(33.3%)	2	—	—	—	—	2	2	0
Chipping Sparrow	8	5(62.5%)	3	2	—	—	—	7	1	1
Field Sparrow	33	6(18.1%)	5	1	—	—	—	7	2	1
Swamp Sparrow	5	4(80.0%)	3	1	—	—	—	5†	?	?
Song Sparrow	59	37(62.7%)	10	17	4	4	2	82	36	25
Totals	500	112(22.4%)	53	36	15	6	2	204	60(30.6%)	43(21.9%)

* Three eggs removed from nest by author; not used in computing percent hatched and fledged.

† None of the Swamp Sparrow nests was re-visited; these five eggs not used in computing percent hatched and fledged.

Sayornis phoebe. All but two of the 15 Phoebe nests were found between April 14 and May 31; with one exception (a re-nesting), nests found after May 15 contained young. The latest nest, found July 4, contained six young Phoebes which would not remain in the nest after being banded. Nine non-parasitized nests containing 38 eggs fledged 34 young. Four parasitized nests, known to contain at least 18 host and seven Cowbird eggs, fledged three Phoebes and five Cowbirds. Cowbird interference caused the desertion of one nest.

Empidonax traillii. The nesting of the Alder Flycatcher at Ann Arbor has been reported on by Berger and Hofslund (1950). Of 37 nests found in a two-year period, three were parasitized, and one Cowbird was fledged from the four eggs laid.

Eremophila alpestris. In southern Michigan, first nests of the Horned Lark are built before the beginning of the Cowbird's breeding season. Nine nests found between March 19 and April 24 were not parasitized. Ten young larks were fledged from 24 eggs (eight nests).

I offer this evidence of Cowbird parasitism: On June 20, 1948, I heard a fledgling Cowbird giving its food call from the remains of a 1947 Robin (*Turdus migratorius*) nest near the University Hospital. This Cowbird was being attended by a male lark. I tethered the Cowbird on the ground, and the lark fed it for the next five days. The Cowbird got loose on June 26,

but I caught it two days later, and placed it in a Potter trap; within five minutes the lark entered the trap. The Cowbird was kept in captivity until May 27, 1949, at which time it (a male) was released. Moore (1947: 39) reported a "horned lark feeding an almost independent Cowbird" at the Chicago airport on June 20, 1946.

Dumetella carolinensis. Only one of 71 Catbird nests was known to be parasitized: a nest containing four host and two Cowbird eggs, found May 28, 1949. A Catbird was incubating. On May 30 the two Cowbird eggs were gone, but the four host eggs were still there. The nest contained two recently hatched young and two pipped Catbird eggs on June 8.

On May 29, 1948, I placed a Cowbird egg in a Catbird nest containing two Catbird eggs. The Cowbird egg was gone when I visited the nest two days later and there were three Catbird eggs. Three Catbirds were fledged from this nest.

On May 17, 1949, I placed a Cowbird egg in a nest containing five Catbird eggs and with binoculars retreated to cover 40 paces off. Within three minutes, both Catbirds returned to the nest. One Catbird hopped to the ground below the nest with the Cowbird egg in its bill, then flew to a low branch about 30 feet from the nest. I was unable to find any trace of this egg.

Friedmann and others have mentioned the removal by Catbirds of foreign eggs from their nests. I believe that the Catbird is a more common host to the Cowbird in southern Michigan than is generally assumed, and that the reason so few cases of parasitism have been observed is that Cowbirds lay very early in the morning (Hann, 1939: 201) and Catbirds usually remove the eggs immediately on discovering them.

Hylocichla mustelina. Six Wood Thrush nests were found between May 26 and June 10, the seventh nest (under construction) on July 11. From seven nests containing a total of 24 host and two Cowbird eggs, ten thrushes and no Cowbirds were fledged. The six non-parasitized nests were in the University Arboretum, where the Cowbird population was high.

Vireo olivaceus. I found only one Red-eyed Vireo nest because I spent very little time in that species' habitat. A nest found under construction on May 25, 1948, contained a Cowbird egg the following day. This egg I removed. On May 27 I removed another Cowbird egg. I saw the vireo on the nest for the first time on May 28; the nest contained one egg that day, a Cowbird's. On May 29 the nest still held one Cowbird egg, which I removed. On May 31 the nest contained two vireo eggs, and I saw the vireo on the nest (with the two host eggs) daily until June 7. On that date, one Cowbird and one vireo egg were in the nest. The vireo incubated these two eggs until June 14. On June 15 only the Cowbird egg was in the nest and the vireo deserted the following day.

Dendroica petechia. I found Yellow Warbler nests under construction from May 11 to June 4. Although 13 of the 44 nests were observed only once, I saw Cowbird eggs or young in 40.9 percent of the total. Eleven parasitized nests (containing 21 Cowbird eggs) were deserted. Nine additional Cowbird eggs were buried under lining but the nests were not deserted. Hicks (1934: 386) found 42 percent (62 nests) of 146 nests parasitized in Ohio.

Icterus galbula. I did not inspect the contents of any Baltimore Oriole nest. On June 22, 1948, however, I observed a female oriole feeding a recently fledged Cowbird about 40 feet from the oriole's nest. The female oriole was the only bird to give alarm notes when I picked up the Cowbird, although a pair of Song Sparrows had a nest 15 yards away. I tethered the Cowbird and for three days the female oriole fed it and at least two orioles still in the nest. The orioles left the nest on June 25.

Richmondena cardinalis. My earliest date for a Cardinal nest was May 1 (three Cardinal eggs), my latest August 6 (three fresh Cardinal eggs). Seven parasitized nests containing at least 11 host and 13 Cowbird eggs fledged no Cardinals and only two Cowbirds. This high mortality appears to be due to the tendency of the Cardinal to desert when Cowbird eggs are laid in its nest. Mortality of non-parasitized nests, also, was high: nine such nests, containing a minimum of 21 eggs, fledged only four young.

Passerina cyanea. My earliest date for an Indigo Bunting nest was May 26 (two eggs), my latest August 24 (two young). From eight eggs in four non-parasitized nests, six buntings were fledged. Five parasitized nests containing seven host and ten Cowbird eggs fledged two buntings and four Cowbirds.

Spinus tristis. Goldfinch nests with fresh eggs were found from June 12 to August 31. Of 70 nests observed only two were parasitized. I have reported on these in detail (Berger, 1948).

Spizella pusilla. The breeding season of the Field Sparrow extended from the first week of May through August. First nests were found on May 5, 6, and 7 in 1946, 1948, and 1949 respectively. Late nests (each with three sparrow eggs) were found August 7 and 20, 1949. Thirteen non-parasitized nests containing 47 eggs fledged 31 (65.9%) young. Five parasitized nests containing six Cowbird and 16 host eggs fledged one Cowbird and three sparrows. I also observed Field Sparrows feeding young Cowbirds out of the nest on June 15 and August 8, 1948.

Melospiza melodia. I found four nests [3, 4, 4 (one Cowbird), 5 eggs] of the Song Sparrow on April 21, 1946. This was my earliest date for a Song Sparrow nest and also my earliest date for a Cowbird egg. During the four years, 13 nests were found between April 21 and 30; 33 nests in May; six in June; five in July; two in August. In 18 non-parasitized nests, 69 eggs were laid, 31 eggs hatched, and 28 (40.5%) young fledged. Twenty-eight parasitized nests (92 host and 68 Cowbird eggs) fledged 18 (19.5%) Song Sparrows and 16 (23.5%) Cowbirds. I observed Song Sparrows feeding young Cowbirds out of the nest on the following dates: May 24 and 31 and June 10, 1948, and May 22 and 31, 1949.

Hicks (1934: 386) found 34 percent (135) of 398 Song Sparrow nests parasitized in Ohio. Nice (1937: 159) reported parasitization of 43.9 percent of 223 Ohio nests observed by her over a seven-year period, although the yearly percentage varied from 24.6 to 77.7. Norris (1947: 90) found 11 (40.7%) of 27 Pennsylvania nests parasitized.

Hann (1937: 202) reported that Cowbird eggs usually were laid in Oven-bird nests during the laying period of that host: "Extreme cases, however, were three days before the first Oven-bird's egg was laid, and three days after incubation began." Friedmann (1929: 186) stressed the coincidence of Cowbird-host laying periods when he said that "a Cowbird has been known to lay an egg in a nest of an Indigo Bunting, containing young. This was a very exceptional case and was doubtless a last resort in an emergency." Norris (1947: 100) called attention to the fact, however, that some Cowbird eggs are laid so long after host incubation has begun that they do not hatch.

A Cowbird egg was laid before the first host egg in five nests which I observed (Phoebe, Red-eyed Vireo, Cardinal and two Song Sparrow). None of these nests was deserted as a result of this early parasitization. Two Alder Flycatcher, one Red-wing, two Oven-bird, and three Yellow Warbler nests, however, were deserted apparently as a result of early parasitization.

A Cowbird egg was laid in a Red-eyed Towhee (*Pipilo erythrophthalmus*) nest after the four host eggs had been incubated at least one full day. On July 1, 1948, I found a Song Sparrow nest which contained one addled Song Sparrow egg, two Cowbird nestlings about 24 hours old, and one Song Sparrow nestling which left as I exposed the nest. The Song Sparrow was feathered and would

not remain in the nest. One of the young Cowbirds disappeared on July 5, but the other fledged July 9. A Chipping Sparrow (*Spizella passerina*) nest which I found June 10, 1947, contained three host young and a fresh Cowbird egg. In a Field Sparrow nest I was observing, a Cowbird egg was laid after one Cowbird and three host eggs had hatched. Walkinshaw (1949: 84) cited two cases in which Cowbird eggs were laid in nests (Field Sparrow) after the host eggs had hatched.

My data also show that the Cowbird tends to lay in deserted nests. I found Cowbird eggs in five Song Sparrow nests after they had been deserted. The interval between desertion of the nest and deposition of the Cowbird egg varied from one to 26 days, and averaged 10.2 days. One nest is of special interest. I found this nest on May 10, 1947, at which time it contained two Song Sparrow eggs; a third sparrow egg and a Cowbird egg lay on the ground a few inches from the nest. It had been deserted by May 15, on which date I placed all the eggs in the nest. On May 19 it contained three Cowbird eggs only. A Vesper Sparrow (*Pooecetes gramineus*) nest deserted on April 24 or 25 held two sparrow eggs on the latter date; on May 20 I removed two *Cowbird* eggs from the nest. One Cowbird egg was laid in a deserted Phoebe nest containing two Phoebe eggs. Nice (1937: 162) noted that three out of 113 Cowbird eggs were laid in deserted Song Sparrow nests. We may infer from this tendency either that the Cowbird is unable to distinguish between active and inactive nests or that, being ready for oviposition, it lays in whatever nest is available to it at the time.

Ornithologists have known for a long time that Cowbird eggs usually hatch before those of the host species. Audubon (1831: 487) said: "In every case the Cow Bird's egg is the first hatched." Bendire (1895: 595) reported that Cowbird eggs hatch "generally in advance of those of the foster parent." Baird *et al.* (1905: 155) noted that "the eggs of the Cowbird are the first hatched, usually two days before the others." More recently, Friedmann (1929: 188) stated that "in the majority of cases, irrespective of the species of bird victimized, the cowbirds' eggs hatch first." Many, perhaps all, of these authors believed that the shortness of the Cowbird's incubation period (ten days, according to Friedmann, *loc. cit.*), accounted for this phenomenon; but Nice (*op. cit.*) and Hann (*op. cit.*) have ascertained that the incubation period is actually at least one day longer than ten. Obviously if the incubation period of the host is considerably longer than that of the Cowbird, the Cowbird eggs will hatch first if they are laid *during* the laying period of the host. On the other hand, Cowbird eggs laid in nests of species having only a slightly longer incubation period than the Cowbird's will hatch first only if deposited on or before the day on which incubation commences. Cowbird eggs usually hatch first, then, because they usually are laid during, or slightly in advance of, the host's laying period. The Cowbird's custom of removing a host egg increases the chances that its own egg will hatch first.

That 'getting a head start' through hatching first is closely correlated with

fledging success seems to be clearly indicated by some of my observations. In six parasitized nests (Wood Thrush, Yellow Warbler, Towhee, Field Sparrow and two Song Sparrow) one or more host eggs hatched first. Every one of these nests fledged one or more host young. Three of them fledged Cowbirds also (one Cowbird and one Yellow Warbler; one Cowbird and three Song Sparrows; one Cowbird and four Song Sparrows). In the following nine nests, on the other hand, Cowbird eggs hatched first: three Phoebe, one Alder Flycatcher, five Song Sparrow. In *only two* of these nests were host young fledged. A Phoebe nest fledged three Phoebes and one Cowbird. A Song Sparrow nest fledged one Song Sparrow and one Cowbird (which, ten days after hatching, was lying dead two feet from the nest the day before the Song Sparrow fledged). Two of the other five Song Sparrow nests fledged no sparrows but three and four Cowbirds respectively. Two Song Sparrow nests, in each of which a Cowbird egg and at least one host egg hatched on the same day, each fledged two Song Sparrows and one Cowbird.

Norris (1947: 100) stated that "No more than two Cowbirds were fledged in a single nest, and this occurred only five times." Table 3, which indicates the relationship between number of host young and number of young Cowbirds fledged in 19 nests, makes clear that three or even four Cowbirds may be fledged from one nest.

On two occasions I found a Song Sparrow nest by watching a female Cowbird. On May 12, 1948, I watched a female Cowbird alight on a weed and peer downward as though looking at or for a nest. I went to the place and flushed a Song Sparrow from a nest containing five eggs (one a Cowbird's). The Cowbird had perched less than a foot from the nest but the Song Sparrow had continued to incubate. I neither saw nor heard the male Song Sparrow during this time, but he appeared and gave alarm notes after I flushed the female. This nest contained three host and two Cowbird eggs when I visited it next on May 14.

Hann (1937: 213) stated that female Cowbirds "discover the Oven-bird's nests by seeing the females building." Nice (1937: 163) believed that Cowbirds find nests both by watching the host build and by direct search. She said further (p. 165): "Cowbirds apparently do not find well concealed nests quite as readily as those poorly concealed, and the same is true of predators." This seems to be a logical conclusion, but at the same time it raises the question of whether or not a nest, well concealed from the human point of view, is also well concealed from Cowbirds and predators. Eight Song Sparrow nests which I thought to be well concealed were parasitized, whereas five nests which I considered exposed were not parasitized. Judging from what I have observed of field nests, I believe that there is a correlation between parasitism and proximity to higher vegetation. In general, parasitized nests in fields were near bordering woodlots or thickets, whereas non-parasitized nests were not near such vegetation. Thickets and trees apparently provide perches and cover for female Cowbirds on the alert for nest building activity.

TABLE 3

SURVIVAL OF HOST AND COWBIRD YOUNG IN 19 PARASITIZED NESTS

Host Species	Host eggs	Host young fledged	Cowbird eggs	Cowbirds fledged
1-Phoebe	5	0	1	1
2- "	4	0	3	3
3- "	5	3	1	1
4-Alder Flycatcher	4	0	1	1
5-Yellow Warbler	4	1	3*	1
6-Cardinal	3	0	2	1
7- "	3	0	3	1
8-Chipping Sparrow	0†	0	1	1
9-Song Sparrow	4	0	4‡	1
10- " "	4	0	5	2
11- " "	3	0	4	3
12- " "	3	0	4	4
13- " "	4	1	2	0
14- " "	2	1§	2	1
15- " "	4	2	1	1
16- " "	4	2	3	1
17- " "	4	3	1	1
18- " "	4	4	1	1
19- " "	5	4	2	1
Totals	69	21	44	26

* Two Cowbird eggs laid after incubation began.

† One Cowbird only in nest when found.

‡ Two Cowbirds died nine days after hatching.

§ Song Sparrow left prematurely when nest was found; Cowbird fledged nine days later.

SUMMARY

A study of Cowbird parasitism in Washtenaw County, Michigan, from 1946 through 1949 involved twenty host species and two additional species believed to be hosts.

The Cowbird laying season extended from April 21 to July 26. Of 112 parasitized nests observed, 53 contained one Cowbird egg, 36 contained two, 15 contained three, six contained four, and two contained five. Of 196 Cowbird eggs observed, 60 (30.6%) hatched. Forty-three of these 60 young Cowbirds (21.9% of the 196 eggs) fledged.

In each of four nests, a Cowbird egg was laid after incubation had begun: in two cases while eggs were still unhatched; in two cases after the young had hatched.

Cowbird eggs were laid in seven deserted nests. The interval between nest-desertion and deposition of the Cowbird egg in five Song Sparrow nests varied from one to 26 days and averaged 10.2 days.

The relative time of hatching of host and Cowbird eggs is important in the

fledging success of the respective species. Host young were fledged from each of six nests of five species in which the host eggs hatched first. In only two of nine nests in which Cowbird eggs hatched first were host young also fledged. Both host and Cowbird young were fledged from two Song Sparrow nests in which a Cowbird egg and at least one host egg hatched the same day. Host eggs hatched first in two Song Sparrow nests which fledged three host and one Cowbird and four host and one Cowbird respectively. Cowbird eggs hatched first in two Song Sparrow nests which fledged three and four Cowbirds respectively but no sparrows.

Parasitized nests of field-nesting species which I observed were in portions of fields bordered by a woodlot or thicket, whereas non-parasitized nests were not near such vegetation.

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NOTES ON THE BIRDS OF THE MIDWAY AND WAKE ISLANDS

BY ALFRED M. BAILEY

On March 14, 1913, George Willett and I spent the day on Sand and Eastern Islands of the Midway Group, observing birds and liberating a few Laysan Rails (*Porzanula palmeri*) and Laysan Finches (*Telespiza cantans*) which we had captured on Laysan Island. Previous plantings of these birds had been made. The two species thrived there for many years following our visit.

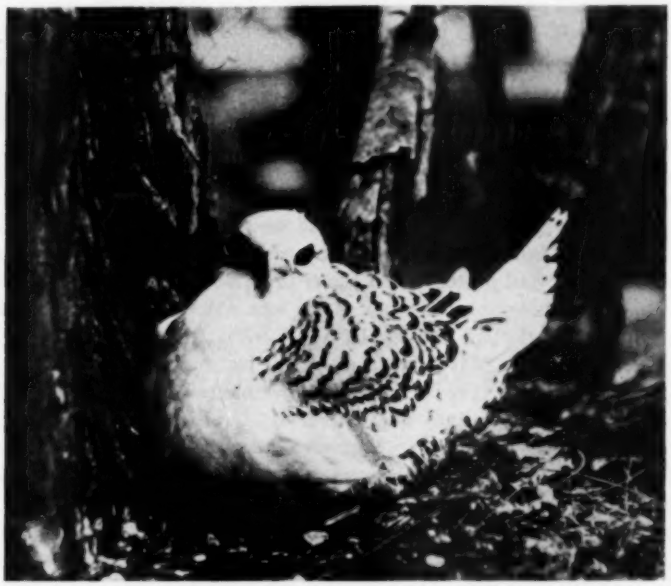

FIG. 1. Almost fully fledged young White-tailed Tropic-bird (*Phaëthon lepturus*) in nest in broad crotch of ironwood tree (*Casuarina* sp.) about ten feet above ground. Photographed on Sand Island, in the Midway Group, on November 22, 1949, by Alfred M. Bailey.

When R. J. Niedrach and I visited the Midways from May 4 to 11, 1949, however, we looked in vain for these rails and finches. They apparently had been exterminated by rats which had escaped from ships during the last war. We saw no unusual birds on that visit except a few flying White-tailed Tropic-birds (*Phaëthon lepturus*).

While returning to Honolulu from Australia later that year I again visited the Midways, arriving November 21. By that date both the Laysan Albatross (*Diomedea immutabilis*) and Black-footed Albatross (*D. nigripes*) had returned to Sand Island and many of the latter had eggs, but I did not see eggs of the former until I visited Eastern Island on November 23. Along the Sand Island plane runways I saw many Turnstones (*Arenaria interpres*) and American Golden Plovers (*Pluvialis dominica*), and on Eastern Island about a dozen Bristle-thighed Curlews (*Numenius tahitiensis*) and four Wandering Tattlers (*Heteroscelus incanus*).

In ironwoods (*Casuarina* sp.) near my headquarters on Sand Island many Hawaiian Terns (*Anous minutus*) were nesting. In an ironwood, about ten feet above ground, I found a nearly full grown young White-tailed Tropic-bird sitting in its nest. I made a point of noting that the bill of the young bird was yellowish; that of the young Red-tailed Tropic-bird (*P. rubricauda*) is black. The nest was a bare crotch about ten or twelve inches wide, more or less surrounded by upright stubs (see Fig. 1). The tree was about a foot and a half in diameter at its base.

In the harbor I tried to collect a loon (*Gavia*), but it was so wild that I could not even get close enough to tell what species it was.

Navy Photographer Harold Fawcett told me that several Short-eared Owls (*Asio flammeus*) had been seen repeatedly on the island the preceding mid-June and that he had photographed one of them after it had been captured. I inspected this photograph but could not be sure which of the several possible geographical races the bird represented.

I visited Wake from May 11 to 15, 1949. The main island was nearly devoid of bird-life at that time. The only birds I saw were a few American Golden Plovers. I searched for Wake Rails (*Rallus wakensis*) but did not find any, and was told that none had been seen since the reoccupation of the island by Americans. Rats, or possibly the starving Japanese troops themselves, may have exterminated them.

I was deeply interested in a Japanese military officer's diary found among the war ruins. When the diary was written some four thousand Japanese were being subjected to daily air attacks by the Americans, and they were cut off from all supplies. Almost every entry was on the subject of food, a typical one being: "The diet has been reduced again. I'm sick and tired of it. A formation of eight bombers hit the island."

Another entry was: "Pay day. What good is money? It all goes into savings. Private Ikeda was put in jail for eating 16 cans of meat. He was tortured by cutting down his diet until he died today. Exchanging life for only 16 cans of meat. O God! save our soul! He was one of the healthy fellows in our squad. Otori [Wake] is a dangerous island."

The entry for July 31 was: "Many enlisted men dying of starvation. One patrol plane."

Considering the terrible times the soldiers were having, I marvelled at the following entry: "August 22. Two night alarms and one day. The enemy seems to know how to harass us. What a life! An order has just come out forbidding us to catch gooney birds [albatrosses] lest they be wiped out."

The efforts of this officer to protect the 'gooney birds' must have been largely in vain. Most of the birds were destroyed by the starving soldiers, although a great colony of Sooty Terns (*Sterna fuscata*) was guarded so that the eggs could be gathered regularly. The Sooty Tern colony on Peale Island (of the Wake Group) was the largest I had ever seen. On May 14 I saw thousands of birds on their eggs. The downy young were beginning to hatch on that date.

A few Man-o'-war-birds (*Fregata magnificens*) were sitting about on the rusted iron skeletons of bombed naval buildings. Small groups of Noddy Terns (*Anous stolidus*) were nesting in the dwarfed trees known locally as bukas (*Pisonia grandis*). I saw two White-tailed Tropic-birds. It was apparent that the bird population had suffered from the Japanese occupation for, aside from what I have just mentioned, there were no birds. We did not see any boobies (*Sula*), Red-tailed Tropic-birds, or albatrosses. A search for such burrow-nesting birds as petrels and shearwaters was out of the question, for my time was so short. I saw nothing of either.

Denver Museum of Natural History, Denver, Colorado

NEW LIFE MEMBER

Olive Ruth Spencer grew up on a farm in Adams County, Illinois. All her life she has been interested in out-of-door things, especially birds and plants. She did her undergraduate work at Wheaton College and took her master's degree (in biology) at the University of Michigan. She spent five summers at the University of Michigan Biological Station, making, while there, a life history study of the Black-billed Cuckoo (*Coccyzus erythropthalmus*) on which she reported in *The Wilson Bulletin* in 1943. Miss Spencer has taught biology in the Moline (Illinois) High School for the past 23 years, having been head of the department since 1935. Preparing specimens found dead by her students and herself, she has built up a useful collection of birdskins. She is a member of the American Ornithologists' Union, the Illinois Audubon Society, and the Tri-City Bird Club.

A NEW SWAMP SPARROW FROM THE MARYLAND COASTAL PLAIN

BY GORMAN M. BOND AND ROBERT E. STEWART

The breeding of the Swamp Sparrow, *Melospiza georgiana* (Latham), on the Coastal Plain of Maryland was first suspected by Neil Hotchkiss, of the Patuxent Research Refuge, who believed that he heard the species singing in the Nanticoke River marshes during July, 1946, and again in May of 1947. Martin Karplus, Chandler S. Robbins, and Robert E. Stewart investigated this area on July 11, 1947. Of the thirteen adult Swamp Sparrows observed by them on that date, eight were singing males. One of these they collected, finding the testes enlarged. A statement published by Stewart (1947: 73) made clear the fact that the Maryland Coastal Plain was part of the breeding range of *Melospiza georgiana*.

That the one breeding example just referred to was much darker than breeding specimens of *M. g. georgiana* from New York, Pennsylvania, and West Virginia was readily apparent when it was first critically examined in 1947. Consequently, in the summer of 1950, the authors collected four more breeding adults in the same marshes from which the 1947 example was taken. The difference exhibited by this small series of five birds is so striking that we do not hesitate to describe them as new. They may be known as

Melospiza georgiana nigrescens, new subspecies
Coastal Plain Swamp Sparrow

TYPE.—Adult male, U. S. National Museum No. 418565 (Fish and Wildlife Service Collection); Wicomico County, Nanticoke River marshes, opposite Vienna, Maryland, June 24, 1950; collected by Gorman M. Bond and Robert E. Stewart (original number 120).

SUBSPECIFIC CHARACTERS: Similar to *Melospiza georgiana georgiana* (Latham) of the northeastern United States and southeastern Canada, but in breeding plumage the black streaking of the upper parts distinctly heavier, especially on the nape and dorsal region; feather edgings of the upper parts much grayer, less rufescent and buffy; tail and bill averaging darker; flanks noticeably less buffy. Seven specimens taken at Vienna, Maryland, in November resemble the new form in length of wing and tail, and we consider them representative of the breeding population of that area. These birds are similar to *M. g. georgiana* in comparable plumage but the brown of their upper parts is somewhat richer and darker, and the light edgings of their dorsal feathers are considerably less distinct. Similar also to the pale form, *M. g. ericrypta* Oberholser, of central western Canada and eastward, but in both breeding and

winter plumage feather edgings of the upper parts considerably narrower, not so whitish. General coloration of dorsal region even darker than when compared with the preceding race.

MEASUREMENTS IN MILLIMETERS: Adult male (three breeding specimens): wing (chord), 62.0–63.5 (63.0); tail, 59.0–61.0 (60.0). Adult male (four breeding specimens): exposed culmen, 11.0–11.5 (11.2); tarsus, 22.5–24.0 (23.2); middle toe without claw, 15.0–16.5 (15.6). Adult female (1 breeding specimen): wing (chord) 57.5; tail, 57.0; exposed culmen, 11.5; tarsus, 22.5; middle toe without claw, 15.0. Measurements of November birds are as follows: Male (four specimens): wing (chord), 62.5–63.5 (63.0); tail, 58.5–61.5 (60.5); exposed culmen, 10.0–10.5 (10.2); tarsus, 21.5–22.5 (22.0); middle toe without claw, 13.5–15.0 (14.3). Female (three specimens): wing (chord), 58.0–64.0 (60.3); tail, 54.0–57.0 (55.8); exposed culmen, 9.0–10.0 (9.3); tarsus, 20.0–21.5 (20.8); middle toe without claw, 14.0–15.0 (14.5).

Although the above measurements are based on a very small sample, they indicate that *nigrescens* may be slightly larger than the nominate race. Sixteen breeding *M. g. georgiana* from New York, Pennsylvania, and West Virginia measure: Male (eleven specimens): wing (chord), 60.0–64.0 (62.0); tail, 55.0–63.5 (59.0); exposed culmen, 10.0–12.0 (10.5); tarsus, 21.0–23.5 (22.1); middle toe without claw, 14.5–15.5 (15.2). Female (five specimens): wing (chord), 56.0–62.0 (59.1); tail, 52.5–56.5 (54.9); exposed culmen, 9.5–11.0 (10.1); tarsus, 21.5–22.5 (22.0); middle toe without claw, 14.0–15.5 (14.9).

GEOGRAPHIC DISTRIBUTION: Breeds in the Nanticoke River marshes, Wicomico County, across the river from Vienna, Maryland, and possibly also in other brackish tidal marshes where vegetation is suitable along the east shore of Chesapeake Bay in Maryland and Delaware. Present indications lead us to believe that *M. g. nigrescens* is resident in the Nanticoke River marshes. Breeding birds from southeastern New York, northern New Jersey, and southeastern Pennsylvania are darker than specimens from farther inland but are not as dark as the new race, and we consider them intermediate in color between *nigrescens* and *georgiana*.

BREEDING SPECIMENS EXAMINED: New York: Severance, 1♀. New Jersey: Overpeck Creek (near New York City), 10♂; Leonia, 2♂, 1♀; Newark, 1♂; Fort Lee, 1♂. Pennsylvania: Black Swamp, 1♂, 1♀; Somerset, 1♂, 1♀; Sugar Lake, 1♀; Sandy Lake, 1♂. West Virginia: Blister Run, 2♂; Cranberry Glades, 4♂, 1♀; Durbin, 1♂; Cranesville, 1♂.

REMARKS: Latham's description (1790: 460) of '*Fringilla georgiana*' was based on a migrant bird taken in Georgia. A check of all specimens in the collections of the Fish and Wildlife Service and the U. S. National Museum reveals that there are, in all, thirty eight examples of *M. g. georgiana* and thirty three of *M. g. ericrypta* from Georgia. This evidence that the two forms are equally abundant in Georgia clearly indicates that Latham could have had a

specimen of either when he described the species. The original description is too generalized for any conclusion as to which of these two races he was considering, but nothing about the description suggests that he was basing it on a specimen as dark as the Maryland Coastal Plain form. Of seventy-one Georgia specimens examined by us, none was representative of *nigrescens*.

ACKNOWLEDGEMENTS: For the loan of comparative material the writers wish to thank the authorities of the Academy of Natural Sciences of Philadelphia and the American Museum of Natural History. We would also like to thank Dr. John W. Aldrich, Mr. Thomas D. Burleigh, Mr. Herbert Deignan, Mr. Allen J. Duvall, and Dr. H. C. Oberholser for valuable assistance and advice in preparing the manuscript.

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FISH AND WILDLIFE SERVICE, U. S. DEPARTMENT OF THE INTERIOR, WASHINGTON, D. C.

NEW LIFE MEMBER

Lawrence Irving Grinnell, a graduate of Harvard, retired from business in New York in 1938 to devote his time to ornithology. He received his Ph.D. from Cornell in 1947. He has studied and filmed birds widely throughout the United States, on the North Shore of the Gulf of St. Lawrence, on the west coast of Hudson Bay, and in Trinidad, Guatemala, Colombia, México (including Yucatán), and the West Indies. He has shown his films at numerous meetings ornithological and otherwise. His published papers include one on the bird life of Churchill, Manitoba, one on the nesting habits of the Redpoll (*Acanthis flammea*), and one on the nesting habits of the Lapland Longspur (*Calcarius lapponicus*). Always actively interested in outdoor pursuits, he has travelled over 7,000 miles on canoeing and high mountaineering expeditions. He has served as a vice president of the Appalachian Mountain Club.

GENERAL NOTES

Pacific Loon in Indiana.—On or about April 14, 1949, a farmer living near Newcastle, Henry Co., Indiana found a small loon alive, and apparently uninjured, in one of his cornfields. He gave the bird to Marjorie Tapscott, a senior at the Newcastle High School. Miss Tapscott, uncertain as to the bird's identity, showed it to Max Forsyth, her biology teacher. Mr. Forsyth kept the bird in captivity for some days, but fish for it were expensive, so on April 19 he liberated it on a pond in one of the municipal parks. A day or so later he described the bird to me and I was led to believe that it might be a Pacific Loon.

On April 24 the loon was found dead near the nest-site of a pair of Mute Swans (*Cygnus olor*) which bred regularly in the park. On skinning the specimen I found that it was a female with very small ovary. The neck was broken. The exposed culmen measured 51 mm., the wing (primaries not pressed flat) 266; the tarsus 67. The plumage appeared to be that of a fully adult bird in winter except that the wing coverts, which were dark medially, had rather noticeable ashy gray edgings. The upper parts in general were dark gray, darkest and most glossy on the lower hind neck, back, scapulars and rump. The scapulars were sparsely marked with small roundish, not squarish, spots. The under parts were white except for a faint interrupted dusky line across the lower throat, a few not very noticeable dusky streaks on the sides of the chest, the dusky median portion of the longer under tail coverts, and a dusky band (wide at each side but very thin in the middle) across the vent. Nowhere in the plumage —despite the lateness of the date—was there evidence of molt into the handsome breeding dress.

So far as I know this is the first specimen of *Gavia arctica* ever to be taken in Indiana, though Butler in his "Birds of Indiana" included the species hypothetically. For verification of my identification I sent the specimen to the U. S. National Museum, where Allen J. Duvall pronounced it an example of the small New World race, *G. a. pacifica*. It is now No. 18862 in the collection of the Joseph Moore Museum at Earlham College.—James B. Cope, *Earlham College, Richmond, Indiana.*

White Pelican on Ohio Shore of Lake Erie.—During the summer of 1950 the White Pelican, *Pelecanus erythrorhynchos*, was observed on two occasions along the south shore of the Marblehead Peninsula, near the west end of Lake Erie, in Ottawa County, Ohio. On July 19, Charles A. Triplehorn and his wife, Wanda, observed a solitary bird in flight over East Harbor State Park. On August 19, Fred Crates, R. S. Phillips, and James Bruce observed a single bird standing in the midst of a large mixed flock of Herring Gulls (*Larus argentatus*), Ring-billed Gulls (*Larus delawarensis*), Common Terns (*Sterna hirundo*), Black Terns (*Chlidonias nigra*), and Caspian Terns (*Hydroprogne caspia*) on a sandbar about a hundred yards offshore at Bayview Park. The three observers approached the pelican twice, once to within about fifty yards. They obtained excellent views of the bird.

According to Borror (1950. "A Check List of the Birds of Ohio," *Ohio Jour. Sci.* 50: 2) the White Pelican is 'rare' in Ohio. Along the Ohio shore of Lake Erie it has been recorded at least twice—on May 5, 1925, a group of five in the Maumee River, east of Walbridge Park, Toledo (Campbell, 1940. *Toledo Mus. Sci. Bull.* 1: 32), and a single bird May 28, 1944, near Toledo (Mayfield, 1944. *Aud. Mag.*, 46, Sec. 2, p. 6).—Charles A. Triplehorn, *Ohio State Museum, Columbus* and R. S. Phillips, *Biology Department, Findlay College, Findlay, Ohio.*

Marsh Hawk feeding on Black-billed Magpie.—On February 4, 1950, I flushed a male Marsh Hawk (*Circus cyaneus*) from a small patch of willows two miles south of Roosevelt, Duchesne County, Utah. It held in its claws a partly eaten, freshly killed Black-billed Magpie

(*Pica pica*) which it dropped after flying about a hundred feet. Most of the viscera and pectoral muscles had been eaten.

When I returned to the site three hours later the uneaten portion of the magpie still lay in the snow where the hawk had dropped it.

Bent (1946. *U. S. Natl. Mus. Bull.* 191: 151–152) indicates that magpies are seldom used for food by other birds. Starvation may have caused this Marsh Hawk to eat the magpie. Below-freezing weather continued from the middle of December, throughout January, and into February. At the time of my observation, an average of 16 inches of snow covered most of the ground.—MERLIN L. KILLPACK, *Biology Dept., Union High School, Roosevelt, Utah.*

Ruffed Grouse nest predation by blacksnakes.[1]—During the nesting seasons of 1949 and 1950 I observed two instances of Ruffed Grouse (*Bonasa umbellus*) nest predation by the Pilot Blacksnake (*Elaphe obsoleta*) on the Beaver Creek Wildlife Management Area in McCreary and Pulaski Counties, Kentucky. The instances were:

Blacksnake eating egg of Ruffed Grouse. Photographed on the Beaver Creek Wildlife Management Area in McCreary County, Kentucky, May 17, 1949, by Harold E. Alexander.

1. On May 17, 1949, as H. E. Wallace, H. E. Alexander, J. O. Moynahan and I were checking grouse nests under observation, we found a blacksnake in a nest about five miles northeast of Greenwood in McCreary County. In the nest were four eggs, one of which was also in the mouth of the snake (see photograph). When we had last visited that nest, three days before (May 14), we had flushed the hen from four eggs. Presumably the clutch had been complete at that time, since no more eggs had been added by May 17. Observations recorded in my field note-book on May 17 were as follows:

3:56 p.m. We approached nest on foot from the nearby jeep road. A blacksnake in the nest apparently is attempting to swallow an egg.

3:59 Snake has firm grasp on butt end of the egg with edges of mouth.

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[1] This paper is a contribution from Federal Aid Project 18-R, Kentucky Division of Game and Fish.

4:01 Egg completely within snake's mouth.
4:02 Egg at a position just back of the head.
4:05 A cracking noise heard, apparently caused by breaking of the egg. Egg not crushed, however, since it still forms a bulge in the body.
4:06 Egg moving back much faster.
4:08 Egg has reached a position 6 inches behind the head and still moving fast. Snake attempting to take another egg.
4:12 Egg about 15 inches behind snake's head. Snake attempting to obtain grasp on second egg. It seems that pains are taken in selecting the large end of the egg. In approaching the egg, snake had turned its head in opposite direction from that in which first egg was consumed. In this operation the egg was shifted slightly. Snake shows no fear of us as we stand within a few feet of the nest.

We caught the snake before it had swallowed the second egg. On killing it and opening the alimentary tract, we found the shell of the first egg cracked and the yolk running out. The estimated total length of the snake was 54 inches. We did not see nor hear the hen grouse while making these observations.

At 8:30 a.m. on May 18 we visited the nest again, flushing the hen from her clutch of three eggs, all of which seemed to be in perfect condition. We continued to visit the nest almost daily until May 31, on which date we found it empty.

2. On May 14, 1950, at 7:25 a.m., I visited a nest four miles east of Alpine, Pulaski County, finding it empty. I had first visited this nest on April 14, on which date it had held three eggs. On April 26 the ninth and last egg of the clutch had been laid. The nine eggs had been incubated about 17 days when I last saw them on May 13. On the 14th the nest was warm and dry, in contrast to the surrounding leaves which were wet from a recent shower. I decided that it had been unoccupied only a short time. While I was critically examining the leaves of the nest's bowl a grouse flushed about 30 feet away. For half an hour I could hear the bird calling intermittently in the distance. It did not return to the nest. At 8:15 I found and captured a blacksnake 21 feet from the nest. On cutting open the intestinal tract, I found the entire clutch of nine grouse eggs, each cracked, and each containing a large embryo. The snake was 60½ inches long.—FREDERICK C. HARDY, *133 North Central, Somerset, Kentucky.*

Abnormal throat-color in male Bob-white Quail.—In three male Bob-white Quail (*Colinus virginianus*) which I have had occasion to examine recently, the white throat-patch was boldly divided by a median black area or stripe. In one individual, a bird shot near Alva, Woods County, Oklahoma by Arnold Purviance of Mooreland, a black stripe about a quarter of an inch wide extended from the chin almost to the end of the throat-patch. The rest of the plumage of the head and body was, so far as I could see, normal. Wallace Hughes made a sketch of the head of this bird. A black and white reproduction of this sketch appeared on the back cover of the February, 1949, issue of *Oklahoma Game and Fish News*.

The two other abnormally colored specimens were among six male birds shot *from one covey* in eastern Cleveland County, Oklahoma, in December, 1949, by Earl Johnson of Norman. In these birds the black median area was a quarter of an inch wide, about as in the Woods County specimen discussed above. The heads of the two specimens were mounted and placed in the University of Oklahoma Museum in Norman.

Stoddard (1931. "The Bobwhite Quail. Its Habits, Preservation and Increase", p. 88 and plate 18) states that this color variation occurs very rarely. I have not found any other reference to Bob-whites with partly black throats.—GLENN JONES, *1115 W. Garver, Norman, Oklahoma.*

Egg-laying, incubation, and fledging periods of the Spotted Sandpiper.—Witherby *et al.* (1940. "Handbook of British Birds", 4: 303) stated that the period of incubation for the

Spotted Sandpiper (*Actitis macularia*) was 21 days, "not 15 as given in Bent's work." A more detailed account by Miller and Miller (1948. *Auk*, 65: 562) gave, for three nests at Belle Isle, near Detroit, Michigan, 20 to 22 days, and references showing periods from 19½ to 21 days. Nelson (1930. *Bird-Banding*, 1: 8) gave an incubation period of 21 days for one Michigan nest.

Miller and Miller (*op. cit.*, p. 561) stated that in seven nests observed by them one egg was laid daily, but that in two other nests one day was skipped between the laying of the second and third eggs. The latter part of this statement was, according to a personal letter from the authors, slightly in error: in one of the "two other nests" a day was skipped between the laying of the first and second eggs; in the other a day was skipped between the third and fourth eggs. These authors stated, in their paper (*op. cit.*, p. 566) that the chicks began to fly at 14–15 days of age.

At a nest which I found in May, 1950, the egg-laying pattern was distinctly different from anything suggested above. The nest was near the Carrie Dam in the Preston Frith, in Butler County, Pennsylvania, 30 miles due north of downtown Pittsburgh. A transcript of my record follows:

Sunday, May 14, 1950, shortly before noon E.D.S.T. the bird was flushed from one egg, presumably shortly after she had laid it.

May 15	5 p.m.	still only one egg
May 16	5 p.m.	two eggs
May 17	5 p.m.	two eggs
May 18	7 p.m.	three eggs
May 19	5 p.m.	four eggs, and bird sitting
June 11	noon	four eggs, none hatched
June 12	7 p.m.	one dead young in nest, other three gone.

The slow rate of egg-laying surprised me: it took five days (May 14–19) to increase the clutch from one to four eggs—almost two days per egg. The weather was favorable, but cool at night at the water's edge.

The incubation period was between 23 and 24 days (May 19–June 12), appreciably longer than anything recorded in the literature above mentioned.

So far as I could tell, the hatching was normal. The dead young one was dry and fluffy, apparently having been for some hours outside the shell.

From the time incubation started I noted only one adult sandpiper at the dam at any time, this despite the frequency of my observations. I do not know what the sex of the one bird was. After the eggs hatched I several times observed one adult and two young some two hundred feet from the nest in the spillway from the dam, and later along the shore close to the nest-site. Witherby *et al.* (*loc. cit.*) stated that the young were "tended by one parent." Nelson (*op. cit.*, p. 2) stated that incubation and brooding were done by the male bird only.

On June 26 and 27, when the young were 14–15 days old, they did not fly, even when my dog chased them, but on the 30th they flew without provocation. Their fledging period was a day or so longer than that reported by Miller and Miller.—F. W. Preston, *Butler, Pennsylvania.*

Short-billed Marsh Wren breeding in Kansas.—On August 26, 1950, in a field south of and adjacent to U.S. Highway No. 40, and eight miles west of Lawrence, Douglas County, Kansas, we discovered at least six singing Short-billed Marsh Wrens (*Cistothorus platensis*). A specimen shot by Tordoff that day proved to be a male (UKMNH No. 29664) with much worn plumage, completely ossified skull, and considerably enlarged (about 6 x 4.5 mm.) testes.

A search of the literature revealed that, despite Gosse's calling the Short-billed Marsh Wren a rare summer resident in the state (1891. "History of the Birds of Kansas," p. 617), the A.O.U. Check-List's inclusion of eastern Kansas in the breeding range (1931, p. 249), and Bent's statement that the species breeds south "to . . . central Missouri (St. Louis and Kansas City)" and "west to western Missouri (Kansas City) . . ." (1948. *U. S. Natl. Mus. Bull.* 195: 274), there was no definite breeding record for Kansas.

This being the case, we returned to the same field four days later (August 30) and hunted until we found a nest. Two wrens obviously were in possession of it, for one sang frequently and the other scolded vigorously while we were in the immediate vicinity. The nest held four eggs. After watching the scolding bird enter, we waited about three minutes, then flushed and collected it, finding that it had a well defined brood-patch. On obtaining the singing bird, we noted that its plumage, like that of the first specimen, was much worn, but that it had no brood-patch. The birds proved to be a male and female (UKMNH Nos. 29665 and 29666). Neither was fat. In each the skull was completely ossified. In neither had the postnuptial molt started. The testes of the male measured about 7 x 5 mm., the ovary of the female about 4.5 x 3.5 mm., the largest ovum having a diameter of about 1 mm. The four eggs proved to be consi lerably dehydrated and without visible embryos.

The population of wrens from which the three adults and the nest and eggs were taken ranged over nearly ten acres of gently southward sloping hillside. The vegetation of the area was a mixture of rank weeds and grasses, approximately four feet high, interspersed with many clumps of smooth sumac (*Rhus glabra* L.). The nest itself was 12 inches above the ground in little blue stem (*Andropogon scoparius* Michx.) and was constructed of dried and green blades of the same and other species of grass. The hillside, although heavily overgrown with weeds and grasses, could not by any stretch of the imagination have been called a marsh or swamp. In years of normal spring and summer precipitation, it would doubtless be relatively dry. In 1950, however, approximately 23.6 inches of rain fell in the Lawrence area between June 1 and September 1, and this excessive moisture may have been responsible for the wrens' nesting. Many lowland meadows in eastern Kansas should, it seems to us, offer a suitable nesting environment for this species even in seasons with much less rainfall.

Bent (*op. cit.*, 276) gives August 20 (New Jersey) as the latest "egg date" for the Short-billed Marsh Wren. Although the condition of the eggs in the nest described above indicated that they had been incubated for some time, the date, as far as we can tell, is the latest on record for a clutch attended by a female.—HARRISON B. TORDOFF AND GEORGE P. YOUNG, *Museum of Natural History, University of Kansas, Lawrence.*

***Turdus migratorius achrusterus* and *Passerculus sandwichensis mediogriseus* in the Northern Panhandle of West Virginia.**—On April 2, 1949, at Beech Bottom, Brooke County, West Virginia, I collected from a flock of about 200 Robins two male specimens which appear to belong to the small 'southern' race, *achrusterus*. They measure respectively: wing, 122, 124 mm.; tail, 90, 90; exposed culmen, 19, 20; tarsus, 30, 32.

The Savannah Sparrow is a rather common summer resident in the open hilltop farmlands of the Northern Panhandle at elevations from 1000 to 1200 feet. To ascertain which subspecies nested in the region, I collected a breeding male on May 28, 1949, half a mile northeast of West Liberty, in Ohio County, finding that it represents the race *mediogriseus*, the breeding form of northern Ohio. It measures: wing, 70 mm., tail, 49, exposed culmen, 10.5, tarsus, 19.

Dr. Herbert Friedmann of the U. S. National Museum has handled the above discussed three specimens and concurs as to their identification.—LT. KARL W. HALLER, *Killeen Base, Killeen, Texas.*

Notes on *Icterus nigrogularis* and *I. chrysocephalus* in Surinam.—In his interesting and important paper, 'Convergent Evolution in the American Orioles,' Beecher (1950. *Wilson Bulletin*, 62: 70) states that the Yellow Oriole (*I. nigrogularis*) is an "arid zone" bird. This is wholly counter to my experience in Surinam, where the species is confined to swampy areas along the rivers and outer coasts. Conspicuous because of its melodious, flutelike notes, it is one of the most characteristic birds of the *parwa*, the broad strip of mangrove (*Avicennia nitida*) along the seashore. It is also found in the *brantimaka*, the thorny thicket of sickle-pod (*Drepanocarpus lunatus*) fringing the muddy banks of the rivers. I have never found it breed-

ing in the savanna belt in sandy country in the interior. Its long pendent nest is built near the end of an outer branch of either an *Avicennia* or *Drepanocarpus* plant, in the former often at considerable distance above the ground.

Eggs of *I. nigrogularis* in the large Penard oölogical collection from Surinam were collected in February, June and August (Hellebrekers, 1942. *Zoologische Mededeelingen*, p. 268). I can give some additional data. On July 9, 1946, not far from the coast at Coronie, I observed a pair

Nest of *Icterus nigrogularis* in low-growing mangrove. The entrance, which is at the top, leads directly down into the nest. Photographed at Coronie, Surinam, on July 11, 1946, by F. Haverschmidt.

building a nest in a low *Avicennia* plant. The first egg was laid on July 11 (see photograph). I observed birds building nests in low-growing *Avicennia* also at Nieuw Nickerie on July 24 and December 19, 1946. Along the Surinam River, at the plantation 'La Liberté', on March 9 and June 29, 1947, I observed birds at nests built in *Drepanocarpus*. On the coast, near the mouth of the Surinam River, I saw occupied nests on August 1 and 5, 1946.

As for the so-called Moriche Oriole (*I. chrysocephalus*),[1] on the other hand, I have never

[1] Hellmayr (1937. Cat. Birds Amer., part 10, p. 114) gives this species the common name 'Moriche Oriole.' *Moriche*, *morichi*, *murichi* and *miriti* are listed as common names of the palm *Mauritia flexuosa* in H. L. Gerth van Wijk's "A Dictionary of Plant Names" (1916. 1: 821), but I find no statement there concerning the derivation of any of the words. *Moriche* is conceivably a barbarism—a mere mispronunciation or misspelling of *Mauritia*.—G.M.S.

found it in the above-mentioned swampy habitat. It is, according to my experience, a bird of dry areas—sand reefs on which the vegetation grows in long rows paralleling the coast, and forest-fringed savannas of the interior. In the large savanna near the airfield at Zanderij, on March 6, 1949, I observed a pair of the handsome birds building their nest in a *Maurítia flexuosa* palm tree. (For a photograph of a palm of this species see *The Auk*, 1948, plate 6.) The nest was neatly woven of dry leaves and sewn under a frond just too high for me to reach from a standing position on the ground. On March 20 it contained two eggs which broke as I was trying to collect them and the nest.—Fr. Haverschmidt, *P.O. Box 644, Paramaribo, Surinam, Dutch Guiana.*

Brewer's Blackbird in Indiana.—On May 18, 1950, I collected an adult male Brewer's Blackbird (*Euphagus cyanocephalus*) in Noble County, just north of Ligonier, Indiana. I observed the bird for about fifteen minutes before collecting it. During most of this time it perched on a fence along the highway at the edge of a large pasture. It sang several times. It was not part of a blackbird flock, but I saw and heard Cowbirds (*Molothrus ater*), Grackles (*Quiscalus quiscula*) and Red-wings (*Agelaius phoeniceus*) in the vicinity that day. So far as I know the Brewer's Blackbird has not actually been collected before in Indiana. Butler, in his "Birds of Indiana" (1897. Indiana Department of Geology and Natural Resources, 22nd Annual Report, p. 1178) listed it hypothetically on the basis of Ridgway's records from Mt. Carmel, Illinois. It has, I understand, been seen several times recently (in the early spring of 1950) in the vicinity of South Bend, Indiana. My specimen was collected about thirty miles east of South Bend. The skin is now in the Joseph Moore Museum at Earlham College, Richmond, Indiana.—Russell E. Mumford, *812 East Hendrix Street, Brazil, Indiana.*

Generic Placement of the Rufous-winged Sparrow.—Most recent authors have given the Rufous-winged Sparrow the scientific name *Aimophila carpalis*, a notable exception being van Rossem (1936. *Trans. San Diego Soc. Nat. Hist.*, 8: 144) who, without going into details, referred to it as "a typical *Spizella* in almost every respect," then, nine years later, unaccountably reversed his position (1945. "A Distributional Survey of the Birds of Sonora, México," *La. State Univ. Mus. Zool. Occ. Papers No.* 21: 274). The suspicion that *carpalis* may be a *Spizella* seems to me to be justified.

My field experience with the species has been confined to Sonora. In his work on the birds of Sonora, van Rossem (*op. cit.*, p. 275, footnote) expressed doubt that *carpalis* bred in the southern part of that state. Reporting a lack of records for the period from June 22 to November 5, he stated that specimens taken in May and early June "showed only the beginning of sexual activity, none were paired, and all were in various stages of the complete prenuptial . . . moult." In 1946, Moore (*Condor*, 48: 117–123) reported evidence that *carpalis* bred in southern Sonora, and extended the species' known range southward into south-central Sinaloa. My observations at Pitahaya, 40 kilometers southeast of Empalme, Sonora, from October 29 to November 1, 1946, confirm earlier observations that *carpalis* breeds commonly in that part of the state.

At that time Rufous-wings were found in pairs or individually, spaced about as they would be in the breeding season. When one member of a pair was collected, the other remained nearby. Association with small, wandering flocks of non-resident Brewer's Sparrows (*Spizella breweri*) and Clay-colored Sparrows (*S. pallida*) occurred, but such association was loose and only brief. The Rufous-wings sang intermittently, a few of them regularly (for varying periods) from prominent perches. They were most common in open mesquite groves throughout which the trees were ten to fourteen feet high and the interspaces largely grassy.

On November 1, I discovered a pair of adults with three bob-tailed juveniles at most two or three days out of the nest. I collected the young birds and the male parent, finding the

latter to be in an early stage of the postnuptial molt. One testis was 5.5 mm. long. The male of another pair collected had just started to molt (one testis measured 3.5 mm.) but the female had not begun to molt. In two additional male specimens, both in early stages of the molt, the testis length was 3.0 and 1.5 mm., respectively. These records, with those of Moore (*loc. cit.*) indicate that in southern Sonora the Rufous-winged Sparrow breeds in the fall. Eggs may be laid as late as early October. Whether the species breeds also in the spring and summer, or only in the spring and summer when the season is wet, remains to be ascertained.

Now for available behavioristic evidence as to generic affinities. *Carpalis* moves about through the grass and brush like a *Spizella*. Its posture and manner of perching conspicuously on high twigs in shrubbery distinctly suggest the Field Sparrow, *Spizella pusilla*. The alarm note is a *Spizella*-like *tzeep* or *tsip*. The song suggests that of *Spizella pusilla*, *S. pallida*, *S. passerina* and *S. breweri* in that it is weak, monotonous, and not very noticeable. After opening with several broken, rather clearly enunciated notes, it becomes a series of seven or eight less loud, quickly repeated notes all at the same pitch. One male repeatedly sang a steadily accelerating series of five to nine notes—a song-pattern similar to that of *S. pusilla*. In these features of behavior *carpalis* appears to be far removed from *ruficeps* and *rufescens*, the species of *Aimophila* best known to me in the field. On the other hand, as mentioned above, whenever I saw *carpalis* in flocks of *Spizella breweri* or *S. pallida* I was impressed with the similarity in behavior of the three species.

Some evidence along these lines is available in the writings of early observers of Arizona birds. Henshaw (1875. Zool. Exp. W. 100th Merid., p. 291) stated that *carpalis*, "unlike the other *Peucaea* [*botterii*, *cassini*, and *ruficeps*], never attempted concealment by hiding in the grass, but immediately took wing . . . In habits and actions, it greatly resembles the Chipping Sparrow." Bendire (1882. *Orn. and Ool.*, 7: 121–122), from experience with 43 nests of *carpalis*, wrote that the "nest is usually . . . in low bushes . . . from six inches to five feet from the ground . . . firmly fixed into a fork or crotch . . . . The eggs . . . are of a very delicate pale green color and unspotted. . . ." Bendire's observations on nest structure and nest placement again suggest the genus *Spizella*. Absence of spots on the eggs suggests *Aimophila* rather than *Spizella*, but I place no weight on this character. Both Henshaw and Bendire comment on the marked gregariousness and sociability of *carpalis*, in which respect it resembles members of the genus *Spizella*. Moore (*op. cit.*, pp. 119–120) confirms Bendire's observations on nest-site and reports that his field experience with *carpalis* agrees with that of early observers.

Ridgway (1901. Birds of North and Middle America, part 1, p. 231), though admitting difficulty in setting limits for the genus *Aimophila*, nonetheless put the Rufous-wing in that genus without comment other than that the bird was closely related to *Aimophila sumichrasti* of Oaxaca. Hellmayr (1938. Cat. Birds Amer., part 11, p. 522) suggested that *carpalis* and *sumichrasti* might be conspecific. *A. sumichrasti* must therefore be observed closely by anyone wishing to decide the generic placement of *carpalis*. This I have not been able to do, but I report my field experience with *carpalis* in the hope that the information will be useful in future study of the problem.—FRANK A. PITELKA, *Museum of Vertebrate Zoology, University of California, Berkeley.*

EDITORIAL

Friends and admirers of Louis Agassiz Fuertes will rejoice to learn that the great bird artist's biography, now being written by his daughter Mary, will be finished by spring or early summer. There is not a person among us—not one—who has not been affected in one way or another by Louis Fuertes or his work. Some of us knew him well and treasure the memory of the hours we had with him. Many of us have heard stories about him—stories that lift the spirit and spread the smiles wider. All of us have seen his bird drawings and, having seen them, have wondered which was the more beautiful, a bird or a Fuertes drawing of a bird. Mary Fuertes Boynton wants this book about her father to be a full, faithful account. If, among our letters, or among our memories, there are facts or anecdotes which would help to give the world of the future a more complete picture of Louis Agassiz Fuertes, let us turn these over to Mary Boynton immediately. Her address is: Mrs. Damon Boynton, R. F. D. 3, Trumansburg, New York.

Applications for the 1951 Louis Agassiz Fuertes Research Grant are now being received by the chairman of the Club's Research Committee, Dr. Charles G. Sibley, Department of Natural Sciences, San Jose State College, San Jose, California.

The Louis Agassiz Fuertes Research Fund was established to encourage ornithological research. The grant is designed to help students and amateur ornithologists in defraying the expenses of their research programs, particularly such items as travel, materials, and equipment.

One hundred dollars is given each year to the applicant selected by the Research Committee on the basis of (1) merits of the applicant's project; (2) prospects of successful completion of the project; (3) ability of the applicant; and (4) financial need of the applicant. All members of The Wilson Ornithological Club are eligible for the grant. Dr. Sibley will supply application forms on request, or the applicant may furnish the following information in a letter: Name, address, and age, ornithological training and experience (no formal training is required as a basis for eligibility); subject of investigation (title, objective, and scope of project; plan of procedure; progress to date); supervisor or consultant, if any; ways in which the money would be used; financial need. A letter of endorsement by some well-known ornithologist or zoologist is desirable but not required. Applications which fail to win the grant in any given year may be re-submitted in following years if desired.

To perpetuate the memory of Frank M. Chapman, and to continue his influence, a memorial fund under control of the American Museum of Natural History was established after his death in 1945 by Mrs. Elsie M. B. Naumburg and her husband, Walter W. Naumburg. Many of Dr. Chapman's friends and admirers have since contributed to this fund, which has grown sufficiently to permit a grant or grants to be made from the income. The Frank M. Chapman Memorial Committee is happy to announce that the first awards may be allotted in the year 1951.

Applications for fellowships should be addressed to the Chapman Memorial Fund, in care of the Department of Birds of the American Museum of Natural History, New York 24, New York. Applicants should state their training and experience and describe the nature and scope of the proposed project as well as the plan of procedure, previous work on the project (if any), and amount of financial aid required. They should also name one or more sponsors.

Projects eligible under the provisions of the Chapman Memorial Fund include field expeditions, intensive studies of behavior of species of birds or of bird colonies, laboratory or museum studies—in fact, almost any kind of sound ornithological research. A sum of approximately $2000.00 will be available for the first grants.

The American Museum of Natural History will be responsible for judging the qualifications of the applicants. Any necessary collections made during the tenure of a Chapman Fellowship will be deposited in the American Museum. Applications must be received before June 1, 1951.

Applications for the Edward L. Chalif Grant for Bird-work in México are now being received by Dr. Sibley. The grant is $200. Applicants should state their plans briefly, making clear the parts of México they intend to visit. Mr. Chalif's desire is to bring to light as rapidly as possible the salient facts of bird distribution in México, for he is working on a field guide covering all the birds of that country. He plans to be in México himself for about five months this coming summer and would like to join a party working there during that same time. Roger Tory Peterson and George Miksch Sutton are to make the drawings for this useful work and to collaborate in any way they can.

Two W. K. Kellogg Bird Sanctuary Fellowships have been announced by Michigan State College. Each of these pays $1200 to a Ph.D. candidate who carries out his research project at the W. K. Kellogg Bird Sanctuary. Persons who do satisfactory work may have their fellowships renewed for one or more years. One fellowship is now available. Inquiries should be addressed to Dr. Arthur E. Staebler, Director of the W. K. Kellogg Bird Sanctuary, Hickory Corners, Michigan.

Your editor, with Ralph M. Edeburn, Robert W. Storer, Philip S. Humphrey, David Parmalee and Peter Stettenheim, all members of the Club, visited the Kellogg Sanctuary late last November and witnessed, with great interest and satisfaction, the capture and banding of 19 Canada Geese (*Branta canadensis*). Cannons-of-a-sort set in a line on the lake-shore *shot* a great net out over the feeding birds, which were promptly put into big crates and taken to a building not far away for banding. Dr. Staebler, who has been active in banding geese since becoming Director of the Sanctuary, keeps a record of each bird handled, carefully determining the sex through anal examination and noting conditions of plumage, irregularities of color pattern, and such details as missing toes. The geese which we 'helped' to band on November 25 were surprisingly tractable, though they beat their wings mightily when not held properly and occasionally bit hard when a hand lingered within tempting distance. Their beauty, as they sprang into the strong wind bearing away their new bands, was thrilling. That was the day of the 'big blow'—a day we shall never forget.

At the meeting of the American Ornithologists' Union in St. Paul and Minneapolis last October many Wilson Club members were honored. Josselyn Van Tyne, for many years editor of *The Wilson Bulletin*, was elected President. Alden H. Miller was elected First Vice-President, Ludlow Griscom, Second Vice-President, Olin Sewall Pettingill, Jr., Secretary, R. Allyn Moser, Treasurer, and Harvey I. Fisher, Editor. W. J. Breckenridge, George H. Lowery, Jr., Frank A. Pitelka, and L. L. Snyder were elected to Council. Maurice Brooks, our President, and Dr. Breckenridge, our First Vice-President, were elected Fellows. F. Haverschmidt of Paramaribo, Surinam, and Helmuth O. Wagner, of Bremen, both members of the Club and contributors to *The Bulletin*, were elected Corresponding Fellows. Harold F. Mayfield, our Secretary, was elected to full Membership. Others elected Fellows were: Harvey I. Fisher, William Rowan, A. A. Saunders, Alexander Sprunt, Jr., and Winsor M. Tyler. Others elected Members were: Anders H. Anderson, Rollin H. Baker, William J. Beecher, Charles H. Blake, Ben B. Coffey, Jr., J. Fred Denton, Alexander D. DuBois, Mary M. Erickson, E. Thomas Gilliard, Horace Groskin, William H. Marshall, Gale W. Monson, Fred J. Pierce, Karl Plath, Hustace H. Poor, Kenneth Racey, William F. Rapp, Jr., W. Austin Squires, Walter P. Taylor, Ruth Harris Thomas, Melvin A. Traylor, Jr., Arthur B. Williams, C. Sloan Williams, and Angus M. Woodbury. In 1951 the Union will meet in Montreal.

During the summer of 1950 the Arctic Institute of North America sponsored two ornithological investigations—a general one dealing with the birds of St. Lawrence Island and the Nome region of Alaska, carried on by T. J. Cade, of the University of Alaska; and a more detailed one dealing with the breeding populations of the Upland Plover (*Bartramia longicauda*) in the vicinity of Burwash Landing, Yukon, carried on by Irven O. Buss of the State College of Washington. An expedition to Baffin Island, led by P. D. Baird, Director of the Montreal office of the Arctic Institute, centered its activities on the east coast. An initial report on this expedition, including a discussion of the birds encountered, is to be published presently in the journal *Arctic*.

Dr. Ira L. Wiggins, of the staff of the Natural History Museum at Stanford University, has recently been appointed Scientific Director of the Arctic Research Laboratory at Point Barrow. This laboratory should furnish an excellent base for anyone interested in studying birds in the arctic. For particulars write the Scientific Director, Arctic Research Laboratory, Point Barrow, Alaska.

We are especially grateful to William C. Dilger, now a graduate student at Cornell University, for making the fine color-plate we are using as a frontispiece for this issue and volume. Mr. Dilger's extra time recently has been used in making a series of canary paintings for the French bird seed people. These we are eager to see in published form.

Jane S. (Mrs. Robert M.) Mengel has consented to serve as a member of our Illustrations Committee. This is good news for all of us—especially for her husband, who happens to be Chairman of the Committee.

A Science Annual, serving as a supplement to the Smithsonian Series, is now being prepared by the Series Publishers, Inc., of New York City. Webster P. True, Editor, who has written us of his plan to "reprint in the Annual some twenty-five or more of the year's outstanding articles appearing in scientific and technical journals," has asked permission to use "Barometric Pressure-Patterns and Spring Bird Migration," by Aaron M. Bagg, W. W. H. Gunn, D. S. Miller, J. T. Nichols, Winnifred Smith and F. P. Woolfarth, a paper which appeared in the March, 1950, issue of *The Wilson Bulletin*.

The Minnesota Ornithologists' Union and Editor Dwain W. Warner are to be commended for their recent publication in *The Flicker* of Arnold B. Erickson's "Bibliography of the Wilson's Snipe." It is to be hoped that other state organizations will exhibit from time to time a scholarly breadth of interest of this sort.

By invitation The Wilson Ornithological Club was officially represented at the inauguration of Dr. Louis Linden Madsen as President of Utah State Agricultural College at Logan on November 3, 1950. Maurice Brooks asked George H. Kelker, a sustaining member of the Club since 1938, to serve us in this capacity.

L. E. Richdale, Honorary Lecturer in Zoology at the University of Otago, New Zealand, and a member of The Wilson Ornithological Club since 1945, arrived in the United States last December. He visited at the University of California and the State College of Washington, stopped for several days in Chicago on his way east, and is now at Cornell University. His book, "The Sexual Behavior of Penguins," is being published by the University of Kansas soon. He plans to attend our annual meeting in Davenport. We hope that he will present a paper on albatrosses, petrels, or penguins—or all three.

Through an unfortunate oversight the name of Betty (Mrs. Herbert E.) Carnes was omitted from the list, published in the last issue of *The Bulletin*, of Americans attending the Tenth International Ornithological Congress in Sweden. Mrs. Carnes is President of the New Jersey Audubon Society. She has been a member of The Wilson Ornithological Club since 1944.

James P. Chapin, who is noted especially for his work on African birds, is now the President of the Explorers Club of New York. He was 'Distant Guest of Honor' at the recent twenty-seventh anniversary meeting of the Cleveland Bird Club.

We regret to announce that several defective copies of the December *Bulletin* were mailed to subscribers. If your copy of the issue had no colored frontispiece please write the Editor at once. A copy complete with color plate will be sent you if you will return the defective copy; or a separate color plate, which can be tipped in, will be sent. Please mail defective copies direct to the Editor.

Just as we go to press, Samuel A. Grimes, of Jacksonville, Florida, offers to have made "at no cost to the W.O.C." the color plates of the Wilson's Warbler kodachrome referred to editorially in our last *Bulletin*. Several other members already have made donations to the color plate fund. This money will be used in printing the plates Mr. Grimes so generously offers to have made.

Mrs. Marjorie Rine Olsen, of Elm Grove, West Virginia, has recently been helping her busy son Jim, our Treasurer, with some of the detail of his exacting job. For one thing she has been keeping straight all records pertaining to names and addresses of members. Mrs. Olsen deserves, and is hereby tendered, our thanks.

University and college students desiring free or inexpensive rooms during the April meeting of the Club should write at once to the Housing Committee, Davenport Public Museum, Davenport, Iowa.

The editors are grateful to the following for assistance in preparing for publication the material appearing in this issue: Aaron M. Bagg, Donald J. Borror, William L. Brudon, James B. Cope, William A. Lunk, Harold F. Mayfield, Ernst Mayr, Rogers McVaugh, Oscar T. Owre, Olin Sewall Pettingill, Jr., Elizabeth Reeder Schwartz, and Milton B. Trautman. Elsa Hertz, long a friend of the Club, has assisted through daily typing of letters and parts of manuscripts.

LETTER TO THE EDITOR

My admiration for the learning and stimulating hypotheses contained in W. J. Beecher's recent article "Convergent Evolution in the American Orioles" (1950. *Wilson Bulletin*, 62: 50–86) is unbounded. I feel, however, that the article ignores certain pertinent facts that, had they been included, might have led to conclusions very different from those presented.

Beecher separates the genus *Icterus* into two genera, *Icterus* and *Bananivorus*, on the strength of what he considers their independent origin from two ancestral South American genera. He thinks that evolutionary modifications have brought about color convergence in several modern species. These modifications have resulted, primarily, from "dietary" changes associated with climatic changes caused by geological events.

This interpretation of color evolution completely ignores a fundamental ornithological concept—namely, that the most striking color patterns in a very large number of species (males particularly) result from the needs of sex advertising, territorial advertising, warning, courtship display, and intraspecific recognition.

Similarly, the interpretation virtually ignores the colors of female orioles. Beecher does not explain why the diet and the climate that he believes have affected the males so remarkably has not similarly affected the females. Females are mentioned only casually and in only two sentences of the 36-page article. The statement, in one of these sentences, that "all orioles reaching the United States are sexually dimorphic" (p. 80) is not essentially true of either *I. graduacauda* or *I. gularis*. The interpretation likewise ignores the colors of immature birds. It is axiomatic that any attempt to trace phylogenetic relationships among birds must take account of immature and female plumages.

Beecher argues that all the American orioles are derived, ultimately, from a quite black ancestor, and that the general trend of evolution has been for black birds in one branch of descent to acquire yellow, and in another branch to acquire yellow, then black again. But, except for two South American species, *cayanensis* and *chrysocephalus*, *none of the 25 to 30 species of* Icterus *has anything approaching a quite black immature plumage*, and in no species does the female have more black in her plumage than the male. Furthermore (still excluding *cayanensis* and *chrysocephalus*), of the 60-odd forms of *Icterus* in which immature and female plumages are known, the immatures of all but one form (*bonana*) are predominantly yellow (i.e., yellowish, grayish yellow, or olive, etc.); and the females of all but 17 are predominantly yellow. In other words, it seems inescapable that the ancestry of practically all orioles but *cayanensis* and *chrysocephalus* contains a powerful yellow strain. Apparently, black figures little in their ancestry.

Instead of Beecher's two genera (which are weakly differentiated at best, and which contain many species whose inclusion in one genus or the other must be justified by only the most elaborate hypotheses and unverified assumptions) the scheme outlined below seems much more consistent with all the facts.

Icterus may be separated into three very distinct groups that might almost be regarded as subgenera:

1. *Black* birds with yellow shoulder patches. These are confined to South America. The females and young are quite dusky, or black like the males. One widespread species is involved: *I. cayanensis*.

2. *Black-throated* birds whose foreparts and underparts otherwise are yellow—though the black patch may sometimes extend over the face and across the forehead, and down to the breast. Their center of distribution is Central America, where they are numerous and variable. Of the 36 forms usually recognized, only one reaches North America (the region north of the Mexican border), three (of a single species) reach Jamaica and the Cayman Islands, and nine reach South America—though of the latter, three are conspecific with Central American forms, three have developed as isolated forms on small islands, and all are confined to the northernmost fringes of South America. Females of all forms are predominantly yellow, and nearly all immatures are quite yellow.

3. *Black-headed* birds with yellow (or reddish) rump. These are scattered over North, Central, and South America and the West Indies. In some species the sexes are alike; in some the females are yellow; and in most the young are yellow, or yellow with black throat. The troupials of South America (*I. icterus* and *I. jamacaii*) form a special subgroup in which the young are approximately like the adults.

This arrangement takes care of all the nearly 70 forms except *I. bullockii*, *I. jamacaii croconotus*, and *I. j. strictifrons*, all of which are obviously intermediate between black-throated and black-headed forms; *I. bonana*, an isolated insular "black-headed" form in which the head is "very dark chestnut or bay"; and the strange *I. chrysocephalus*. This last species is

almost entirely black; the sexes are alike; the immatures are dusky; it is confined to a relatively small area in South America adjoining the range of *I. cayanensis*; and (as Beecher says) it is probably derived directly from *I. cayanensis*. It should be grouped with the black orioles.

Considering all these facts—well-defined differences among the three groups of males, great similarity of the young and of the females within each group, great difference of young and females in the black group from those of other groups, peculiarities of distribution, well-marked predominance of certain forms in certain areas—I do not see how we can escape the following conclusions:

1. The *black* South American orioles (*I. cayanensis* and *I. chrysocephalus*) probably stem from a black ancestor (as Beecher says), are indigenous to South America, and have not spread away from there.

2. The *black-throated* orioles show no evidence of having stemmed from a black ancestor; they almost certainly stemmed from a yellow ancestor; probably they originated in Central America, and from there invaded southwestern North America and northern South America.

3. The *black-headed* orioles show no evidence (in immature and female plumages) of having stemmed from a black ancestor; many of them must have stemmed from a yellow ancestor; and some of them seem to have stemmed from a black-throated ancestor. Perhaps *I. jamacaii croconotus* and *I. j. strictifrons*, with only the throat and the front half of the head black, and with ranges remote from the black-throated forms, may be only relicts of the ancestral black-throated form; or perhaps they represent a reversion toward the ancestral black-throated form.

In summary, the black South American orioles represent a distinct branch of *Icterus*; and the black-throated and the black-headed orioles represent another branch—with a strong probability that at least some of the black-headed forms descended from black-throated forms.

A hypothesis that might account for the development of black-headed orioles from black-throated ones follows:

Though immatures and females of the family Icteridae may be black, brown, tan, buffy, or yellow indifferently, mature males of the family have developed (or retained) black color characters to an extraordinary degree. Apparently black has great significance (sexual, defensive, aggressive, or attractive) in the family. If black is thus at a premium, it seems likely that black would be especially desirable at the periphery of range, where breeding or survival conditions would be comparatively difficult. If, then, black-throated orioles of Central America have spread from their ancestral optimum range to become a peripheral population, we might expect them to have developed larger and larger areas of black plumage, and thus to have become black-headed.

Admittedly, this is hypothetical. But it would explain the very marked preponderance (also noted by Beecher) of black-headed forms at the periphery of the range of the black-throated forms—in the West Indies, North America, and South America.

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ORNITHOLOGICAL LITERATURE

GRØNLANDS FUGLE. THE BIRDS OF GREENLAND. Part 1. By Finn Salomonsen. Ejnar Munksgaard, Copenhagen, 1950: 9 × 13 in., 158 pp., 17 color-plates and numerous decorative sketches by Gitz-Johansen. Paper. To be published in three parts, each at 60 Dan. kr. ($8.72), but parts cannot be supplied separately.

This handsome work, which promises to bring us up to date on the birdlife of the world's largest island, possesses to a remarkable degree the charm and rugged beauty of that island. At the beginning of each species writeup the Danish, English and Eskimo bird names are given in large type, together with a little drawing of the bird itself in black and white. The text is presented in two columns, Danish at the left, English at the right. The roughness of the color plates reminds us instantly of wind, cold sea water, and hard ice and rocks. The distributional paragraphs are a kind of symphony of place-names. Some of these all-but-unpronounceable agglutinated words (e.g., Seqineqarajugtoq and Tingmiakulugssuit, the names for certain mountains) will not bewilder students of the Eskimo language, for their etymology is clear enough; but even the initiated—those who recall that Angmagssalik is on the east coast and Upernavik on the west—will long for that "small scale map" which is, according to a statement in the introduction, to appear "at the back of the present book" (i.e., presumably, at the end of Part 3).

The distributional material of Part 1 might well have been shortened, simplified, or summarized. Users of the book will welcome detailed discussion of the areas throughout which a given species is known to breed. They cannot object to what at first seems to be over-use of long local names for cliffs, islands, fjords and tide-rips so long as certain general statements remain perfectly clear. But when, in order to ascertain just how far north and how far south a species breeds they have to resort to underlining they may well object to the obfuscating detail. A few statements are regrettably unclear or unidiomatic—e.g., that pertaining to *Branta bernicla*, a species which "has been recorded a few times as breeding south of its actual nesting-range" (p. 82). Some of the general summaries of species-distribution are not wholly satisfactory either. I know from personal observation that *Branta bernicla hrota* breeds southward as far as Lat. 64°N. on Southampton Island, and Gavin (1948. *Wilson Bulletin*, 59: 198) has reported its breeding in the Perry River district just south of Queen Maud Gulf, yet Salomonsen flatly states that the "pale breasted form (*B. b. hrota*) [is] restricted to Spitzbergen, N. Greenland, N. Ellesmere Island and Axel Heiberg Land" (p. 84).

The distributional data on the whole are excellent and exceedingly timely in view of the fact that the forthcoming Fifth Edition of the A.O.U. Check-List will cover Greenland as well as the Arctic Archipelago. The author makes clear that Leach's Petrel (*Oceanodroma leucorhoa*) is not actually known to nest in Greenland; that the nest of the Barrow's Goldeneye (*Bucephala islandica*) has yet to be found anywhere on the island; that the Pintail (*Dafila acuta*) breeds in some numbers on the west coast; that the Green-winged Teal (*Anas crecca*) has not actually been found breeding though it occurs with astonishing regularity in spring (adults) and from mid-September to mid-November (young birds); that the Greenland White-fronted Goose (*Anser albifrons flavirostris*) breeds "only in the low-arctic region of the West-coast, from 64° to 72° 30′ n. lat." (p. 59) and winters "in the British Isles, chiefly in Ireland" (p. 63). Definite statements of this sort have been made possible through banding. One banded Greenland White-fronted Goose has been recovered in December in North America—at Metis Beach along the St. Lawrence River.

Most of the 22 species written up in Part 1 are treated quite fully. The author has had wide experience in the north, but in discussing nesting habits, courtship, molts migration and the

like he has, fortunately, drawn extensively on the experiences and writings of others. His repeated reference to the failure of certain species to breed during adverse summers, notably on the east coast, causes us to wish that this whole subject, as well as the irregularities of the mild periods he has written about elsewhere (1948. *Dansk Orn. Foren. Tidss.*, 42: 85–99), might have been discussed at greater length in the introduction. In many of the life history discussions use of the word 'nocturnal' is unfortunate in that it is almost certain to connote *darkness* to many readers. Students who have observed birds during the breeding season in the far north know full well how little actual darkness there is. The birds come and go, sing, court and feed almost literally at all hours, for the sky is light even in the middle of the night.

Of very special interest are the author's graphic discussion of the cliff-nesting of the Barnacle Goose (*Branta leucopsis*); the striking difference between the colonial nesting of the Eider (*Somateria mollissima*) on islets in salt water and the strictly non-colonial nesting of the King Eider (*S. spectabilis*) inland; the remarkable dependence of the Harlequin Duck (*H. histrionicus*) upon swiftly moving water; the migration of Brant across the notorious ice-cap; and the presence of the beaks of certain cephalopods in the stomachs of virtually all specimens of Fulmar (*Fulmarus glacialis*) examined. Hagerup's guess was that the Fulmars ingested these cephalopod beaks when eating "the faeces of the smaller whales, which feed on cuttlefish."

The Gitz-Johansen drawings are bold and sketchy to say the least. Their technique is exciting. They are not, primarily, bird illustrations at all, but Greenland landscapes or seascapes in which birds happen to figure. Crude as they are, their plant life, rocks, horizons, and skies are authentic. The most successful of them, possibly, is that of the Fulmar—a brisk study chilly enough to make one reach for one's overcoat. Among the least successful is the flying Oldsquaw (*Clangula hyemalis*), which is too small headed, too small footed, too dark in eye-color, and utterly motionless despite its spread wings.—George Miksch Sutton.

DISTRIBUTIONAL CHECK-LIST OF THE BIRDS OF MEXICO. Part 1. By Herbert Friedmann, Ludlow Griscom and Robert T. Moore. Cooper Ornithological Club, Pacific Coast Avifauna, Number 29, Berkeley, California, June 30, 1950: 202 pp., 2 colored plates (used also in *The Condor*). $4.00.

The authors of this first published list of Mexican birds make it quite clear in their introduction that they expect the work to be out of date just as soon as interested readers have had time to point out overlooked data in the literature and to correct the ranges of various species with which they may be individually familiar. Although a few published records have been overlooked, the big gaps in the ranges of many species are no doubt due to lack of published data. For example, the eastern range of the Rufescent Tinamou (*Crypturellus cinnamomeus*) is given as "southern Tamaulipas south through Central America," whereas the bird ranges northward through western Tamaulipas and eastern Nuevo León at least as far as the hills south of Linares. The Western Grebe (*Aechmophorus occidentalis*) is said to be "locally common to June 11" in Baja California, and to occur in certain other Mexican states in winter, whereas actually it is fairly common in several states throughout the summer. Adult and young birds may be observed on prairie lakes in Zacatecas and from the paved highway along the west shore of Lake Chapala, in Jalisco, in June and July. Such large and easily observed birds as the Wood Ibis (*Mycteria americana*) and Roseate Spoonbill (*Ajaia ajaja*) are not listed for the big state of Oaxaca, although both species are quite common in the marshes around Salina Cruz. Since it is probable that anyone using the book will consider the stated ranges as merely suggestive, these faults may be taken lightly. The thing of importance is that we do now have a published list and that some definite points in the range of each species have been set down. The Check-List is welcome and well worthwhile.

The family arrangement is that of Wetmore's "A Systematic Classification for the Birds of the World." The family name is given first, followed by the scientific and common name of the species. The general distribution of the species is given next. This is followed by the scientific name of each subspecies and the detailed range of each. The Mexican common name (usually Spanish, sometimes Mayan, etc.) of each subspecies is also given. Finally there is an excellent index of all the common and scientific names. The subspecies included are largely those recognized by Peters in his "Check-List of Birds of the World" but the authors have exercised "independent judgment" when that has been deemed advisable. In the Accipitridae they do not accept *Accipiter cooperii mexicanus* on the grounds that it seems doubtfully distinct; on the other hand they do accept *Cathartes aura teter* which would seem to be equally doubtful. No two taxonomists will ever agree on such points as these and until there is a definite rule adopted for the acceptance of subspecies on a statistical basis, such arguments will continue. On the whole, the subspecific treatment is sound and conservative.

In an attempt to make the list as useful as possible to field students and to visitors to México who do not collect, each subspecies which the authors believe can be identified in the field has been marked by an asterisk. Such thoughtfulness is certainly commendable. The inclusion of Mexican common names possibly was intended to serve somewhat the same purpose. However, if amateur field students attempt to use these names they will soon find that many of them are not the ones used locally. This is not a criticism of the distinguished Mexicans who supplied the names. We still have somewhat the same trouble in this country with common names supplied by the A.O.U. committee even after four editions of the Check-List.

There is, in the museum at Tuxtla Gutiérrez, Chiapas, a mounted Jabiru (*Jabiru mycteria*) specimen said to have been taken on the river near the city. Other Jabirus are reported to have been seen at the same locality. Since Miguel Alvarez del Toro, who is curator of the museum, is the only Mexican who has been contributing regularly to our ornithological magazines (several short papers or notes from him have appeared in *The Condor* and *The Auk*) it seems strange that he was not consulted. The Check-List indicates that the inclusion of the Jabiru was based on one lone record from Cosamaloapam, Veracruz.

In comparing the various groups in the list, the reviewer received the impression that the hummingbirds were more carefully covered than most other families. If true, this might suggest that the authors became more thorough as they progressed, for this is the last family in the book.—L. Irby Davis.

CANADA GEESE OF THE MISSISSIPPI FLYWAY WITH SPECIAL REFERENCE TO AN ILLINOIS FLOCK. By Harold C. Hanson and Robert H. Smith. Bulletin of the Illinois Natural History Survey, Urbana, Illinois, Vol. 25, Article 3, March, 1950: 6¾ × 10 in., pp. 67–210, frontispiece, 92 figs., 47 tables, bibliography. Paper, 1 copy free; cost of more than one copy to be determined by correspondence.

The authors have been far afield in gathering the material for this informative and detailed report. Hanson, as Game Specialist, spent several years at the Horseshoe Lake Refuge in Illinois where approximately 50% of the Mississippi River Valley Canada Geese wintered during the time of this study. He also spent parts of two summers in the James-Hudson Bay goose nesting area. Smith, as Flyway Biologist for the United States Fish and Wildlife Service, observed this and other Canada Goose populations in various areas of Canada and the United States.

Starting in the north, the authors discuss goose breeding grounds from the standpoint of geography, geology, vegetation, and nesting sites preferred by the geese. Information on the last point should be of great value to those attempting to rebuild Canada Goose breeding populations throughout areas in which the birds once nested commonly.

From this James-Hudson Bay production area the geese are followed south over their fall

migration routes to various wintering concentration points in the United States. One of the more important stopping places in the fall is the famed Jack Miner Bird Sanctuary at Kingsville, Ontario. Here approximately 31,000 Canada Geese were banded between 1915 and the spring of 1944. A discussion of certain outstanding banding records is given.

The various wintering areas of the Canada Geese are taken up, with special emphasis on the Horseshoe Lake Refuge. In the discussion of this particular refuge, the annual hunting losses, the behavior of the geese, and the hunting methods are given primary importance. These points should also be of great importance to states such as Michigan and Wisconsin which each have a number of goose refuges.

The annual bag of the Mississippi Valley geese is separated into three main parts: that taken by Canadians, that taken by Indians on the goose breeding grounds, and that taken by people in the United States. Crippling losses and additional mortality factors are also included in this discussion. A summary of the material on productivity follows.

Having information on productivity, as well as trapping and banding data of the Jack Miner Bird Sanctuary and the Horseshoe Lake Refuge, the authors went further and tried to determine population survival; they found the data inadequate and biased however, so felt that their findings were only approximate.

One of the most important results of the study of the Jack Miner banding data was the discovery of a distinct and heretofore unrecognized group of Canada Geese that winter in the inland areas of Virginia, North Carolina, South Carolina, Georgia, Alabama, and the Gulf Coast of Florida. Because management of the Mississippi Valley goose population should be guided to some extent by a knowledge of neighboring goose populations a brief summary of the breeding and wintering ranges, as well as the migration paths of this newly defined group of Canada Geese, named the 'Southeast population', is given. Other flyway populations are also described.

To meet the problems of the Mississippi River Valley goose population, created by the geese of the Horseshoe Lake Refuge, proper management techniques were applied. At present the population has responded and recovered from its low point of 1945–46.

In summary, this bulletin with its numerous illustrations and well-founded and detailed information should certainly be studied by all concerned with game management and related subjects. The authors have done a very commendable job in bringing together data from widely separated areas on this species.—Laurence R. Jahn.

THE WILSON ORNITHOLOGICAL CLUB LIBRARY

The following gifts have been recently received. From:

Edgar P. Chance—5 pamphlets
Karl W. Haller—4 books
Fr. Haverschmidt—2 reprints
David W. Johnston—5 reprints
Leon Kelso—2 pamphlets
Charles M. Kirkpatrick—1 reprint
Margaret R. Knox—3 magazines
Rosario Mazzeo—16 magazines
James Nessle—2 books
Margaret M. Nice—3 books, 8 reprints, 1 magazine
Allan R. Phillips—10 reprints
Frank A. Pitelka—4 books
Hustace H. Poor—62 volumes of magazines, 8 books
L. L. Snyder—1 pamphlet
O. A. Stevens—1 reprint
Robert E. Stewart—1 reprint
Robert W. Storer—1 reprint
R. M. Strong—29 magazines
University of Wisconsin Department of Wildlife Management—7 reprints
Josselyn Van Tyne—5 reprints
George J. Wallace—1 reprint
F. A. Ward—2 magazines
Harriet Woolfenden—1 book

HORMONES AND CYCLES: A REVIEW

BY DEAN AMADON

The basic causes of cycles in the abundance of hares, voles, grouse and other northern animals are still but little understood. Disease, predators, and parasites have all been suspected, but these are now generally believed to be, if involved at all, no more than contributing factors. Starvation is not likely to be a cause of cycles, except in the case of certain predators which may have secondary cycles reflecting fluctuations in the numbers of their prey. Efforts to show that cycles are caused by sun spot fluctuations have not met with success.

Some years ago Green and Larson (1938) found that at the time of cyclic die-off in the Varying Hare, *Lepus americanus*, in Minnesota, large numbers of these animals perished suddenly of hypoglycemic shock. This "shock disease" involves no pathogenic organism, but has as its immediate organic cause a failure of the liver to store glycogen. Any mild stress, e.g., exercise or capture, may induce convulsions and death in hares at such periods. The significance of these facts became more evident in the light of Selye's (1950) later research on the effects of stresses upon laboratory animals. His findings have been summarized by White (1950: 394) as follows: " . . . all living organisms can respond to stress as such, and . . . in this respect, the basic reaction pattern is always the same, irrespective of the agent used to produce stress. He (Selye) has called this response the General-Adaptation-Syndrome, and its derailments the Diseases of Adaptation." Physiologically, this adaptive response involves the secretion of the adrenocorticotrophic hormone (ACTH) by the pituitary and of the cortisone hormone by the adrenal cortex. Probably other hormones are involved as well, for example, one of the spleen now being investigated at the marine biological station at Naples, a hormone which, it is thought, may be responsible for the phenomenon of "second wind" in man (Crammer, 1950: 361).

Selye pointed out that the shock disease of hares resembled what he called the "diseases of adaptation", but it remained for Christian (1950) to emphasize that Selye had provided what would seem to be a satisfactory explanation of the sudden decimations that occur in cyclic species. Christian visualizes the process as follows (p. 253): "Exhaustion of the adreno-pituitary system resulting from increased stresses inherent in a high population, especially in winter, plus the late winter demands of the reproductive system, due to increased light or other factors, precipitates population-wide death with the symptoms of adrenal insufficiency and hypoglycemic convulsions."

Are birds subject to shock disease? So far as I know, it has not been reported, though the "autumn madness" of Ruffed Grouse, *Bonasa umbellus*, might be correlated with such disturbances. Most investigations of the cycles of this bird have tended to show that the periodic decreases result from heavy mortality of chicks (Bump, Darrow, *et al.*, 1947). This might mean only that in grouse, apparently unlike hares or voles, shock disease occurs among immatures rather than adults. A recent experiment conducted by the New York State Conservation Department (Anon., 1950) did precipitate a "population crash" in Ruffed Grouse and Varying Hares during the winter. The experiment was conducted on Valcour Island (area about 1000 acres) in Lake Champlain. Predators were intensively controlled on this island for a period of five years. Both grouse and hares increased rapidly, but in the winter following the third year there was a drastic decrease in both species. This was attributed, though apparently without much evidence, to disease. Populations on a control area on the mainland remained almost stable. It seems entirely possible that the crash in the two species followed collapse of hormonal defense against multiple stresses following over-population. Most investigators

have found that cyclic decreases in grouse populations are correlated with population density.

In the paper mentioned above, Christian assumes that in species not known to be cyclic, e.g., the Beaver, *Castor canadensis*, the population is held below the critical level by other factors, such as predation by man. It seems possible, however, that collapse of the adreno-pituitary system, with resulting shock disease, in voles and hares is in itself an adaptation to reduce the population of these prolific, short-lived species drastically at times of over-abundance, so that the stresses on the remaining nucleus of breeding stock are quickly alleviated. Wolves and other carnivores, on the other hand, are so very resistant to cold, semi-starvation and other privations that they may never be subject to sudden hormonal deficiencies caused by stress. In man himself, adreno-pituitary exhaustion is often a physiological symptom of schizophrenia resulting from stress—a condition not necessarily fatal (White, *op. cit.*). An even more gradual impairment of the hormonal defense mechanism is implied in the suggestion that the greater average longevity of women as compared with men reflects a "better-damped reaction to stress" (Comfort, 1950).

Investigation of the role played by hormonal deficiencies in population fluctuations among birds will require both field and laboratory studies. The hormones involved in the physiological adjustment of the mammal to stress are proving of great significance in medicine and biology. Does a similar physiological mechanism exist in birds?

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THE DINGELL-JOHNSON ACT: WILL IT BENEFIT BIRD-LIFE?

An eleven-year fight was won on August 9, 1950, with the passage of the Dingell-Johnson Bill (Public Law 681, 81st Congress, 2nd Session). This Act, which will become effective July 1, 1951, will do for fisheries conservation what the Pittman-Robertson Act has done for wild game. Together, these two pieces of legislation will advance all fields of conservation, benefiting bird-life indirectly.

The Dingell-Johnson Act authorizes the appropriation of such moneys as may be collected

from a 10 percent Federal tax on " . . . fishing rods, creels, reels, and artificial lures, baits, and flies . . . " for the preceding fiscal year. The bill *authorizes* the appropriation, but the appropriation proper must be made annually by the Congress. In this respect it differs from the Pittman-Robertson Act which, as now amended, sanctions use of the taxes collected from sporting arms and ammunition during the preceding fiscal year without further action by Congress. The money is proportioned to the States, after they have met qualifications similar to those of the Pittman-Robertson Act. The proportionment is thus: 40 percent in the ratio which the area of each State, including coastal and Great Lakes water, bears to the total area of all the States; and 60 percent in the ratio which the number of persons holding paid licenses to fish for sport or recreation in the State bears to the number of such persons in all the States. No State shall receive less than 1 percent nor more than 5 percent of the total amount appropriated; Alaska, Hawaii, Puerto Rico and the Virgin Islands are provided for. No more than 8 percent of the annual appropriation may be used for administration.

Any money which is appropriated to any State and not expended in the two years' time limit may be used in carrying out the research program of the Fish and Wildlife Service in respect to fish of material value for sport and recreation. This provision should make available to the Service money badly needed for research on migratory fish which, like migratory birds, do not lend themselves well to individual State research or management.

The enabling legislation has defined "fish restoration and management projects" to mean projects designed for the restoration and management of all species of fish which have material value for sport or recreation in the marine and/or fresh waters of the United States. Types of projects acceptable under the law include (1) research projects; (2) management investigations; (3) stocking of waters with food and game fishes including an investigation of the efficacy of such projects; and (4) selection, restoration, rehabilitation and improvement of areas of water or land adaptable as hatching, feeding, resting or breeding places for fish. After 1953, not more than 25 percent of the money allotted to each State may be spent for the maintenance of water areas acquired and developed under the provisions of this Act.

Twenty-five percent of the money required for any of the types of projects listed above must be supplied by the individual State, and the remaining 75 percent is provided by the Federal government under the Dingell-Johnson Act, as with the Pittman-Robertson Act. It is estimated that the Federal tax on sport fishing gear will produce an income of about $3,000,000. If this amount is appropriated by the Congress, and assuming that some 15,000,000 fishing licenses are sold annually, the individual States would receive amounts varying between $26,000 and $132,000 from the Federal government for fisheries work. These figures would be increased by the 25 percent matching funds from the several States.

It has recently been announced that the Dingell-Johnson Act, like the Pittman-Robertson Act, will be administered for the Federal government by the Branch of Federal Aid of the Fish and Wildlife Service, Department of the Interior. Most conservationists agree that this is a wise decision, as this Branch has had more than a decade of experience in administering the Pittman-Robertson funds and has already established a high reputation with the wildlife agencies in each of the 48 States and possessions.

It is obvious that the advancement made possible by this Act will benefit the entire conservation field, especially as provisions are made for employing professionally trained personnel for work in every section of the United States and its possessions. The addition of this relatively large number of full-time wildlife biologists to the existing conservation force is certain to elevate many spheres of natural history other than fisheries. Further, the acquisition and management of land and water areas, as made possible by Dingell-Johnson money, should benefit other forms of animal life as well as fish. For example, it has been demonstrated repeatedly that the acquiring and developing of federal migratory waterfowl areas have been of substantial benefit to many forms of birdlife other than waterfowl. Likewise, it is entirely possible that the acquisition and development of water areas, and certain adjoining land

areas, for fisheries purposes will be beneficial in its effect upon many forms of our birds. As a result of the acquisition and developmental program of the Dingell-Johnson Act, ornithologists may expect to have at their disposal many additional outdoor laboratories, with sympathetic and cooperative fellow workers in charge of these areas.

The passage of the Dingell-Johnson Act, notwithstanding the fact that it has been presented annually to the Congress for many years, poses one rather serious problem, namely, that of immediately securing adequately trained personnel. Where will the trained personnel come from, as of July 1, 1951, to carry out the provisions of this legislation in each of the 48 States? This problem has given the State fisheries people much concern as they know only too well that they require personnel trained to secure biological facts, work with sportsmen, and *get practical results on the ground or in the water*. Perhaps the best type of training for state conservation work is that of serving an apprenticeship in the field, working on a typical project, while taking academic training. It is obvious that adequately prepared personnel, with both academic and "practical" experience, cannot be trained in a hurry. Most states will have their projects up for consideration well in advance of July 1, 1951. Where will the personnel be secured to make the best use of the funds then available? Will the fisheries people repeat some of the mistakes made by certain early Pittman-Robertson project-leaders in undertaking general life history studies with inexperienced personnel and thus throw the stigma of "impractical" on all fisheries research under the Dingell-Johnson Act? Will they, in the rush to secure the needed men, settle for individuals whose qualifications do not justify their assuming leadership responsibilities in the States fisheries field but who will assume such leadership merely because they were the first employed and thus have greater seniority? The inroads which will be made upon conservation personnel by the present military preparedness program may further complicate fisheries personnel problems.

There is little question that the Dingell-Johnson Act will go down in history as one of the most important steps forward in the entire field of conservation. We all have cause to rejoice in its passage.—H. S. Mosby and W. W. H. Gunn.

GRADUATE RESEARCH IN ORNITHOLOGY

Several readers of *The Wilson Bulletin* have expressed interest in learning the extent to which graduate students in American universities were conducting ornithological research in fulfillment of their thesis requirements for advanced degrees. It would be even more interesting to learn of *all* current bird research in the country, but a compilation of that scope we do not have the temerity to tackle, and the present preliminary summary is limited strictly to research being conducted by graduate students. Editor Sutton requested us to assemble what information we could, and as a start we wrote each of the institutions known by us to encourage theses on ornithological topics.

Some workers object to having current research mentioned in print until it has been completed and published in full and final form. They may feel that publishing the titles below will be interpreted as "staking out claims," a procedure which could, possibly, in some cases, hinder research. Outweighing such hazards, we think, are several benefits. Readers of *The Bulletin* undoubtedly have a lively interest in current ornithological research throughout the country. Some graduate investigations might be of such nature that Wilson Club members, once informed of them, could offer cooperation. In some instances unnecessary duplication of effort might be forestalled. Members planning future graduate work might be aided in their choice of a school. At any rate, your reaction as readers may determine whether the compilation will be attempted in future years.

It is recognized that such an initial effort as this cannot but be incomplete for a variety of

reasons. In several cases the response indicated that some students would be selecting thesis topics later. Some reported no ornithological theses in progress just now, but made clear that this type of work was encouraged when possible. Many institutions doing such work we doubtless overlooked, for which we apologize, but we hope that the publication of this preliminary list will stimulate communication from them. Finally, several institutions have not yet responded, probably for perfectly legitimate reasons. Ornithologists are well known to be far-flung travelers, and some of the persons to whom our inquiries were directed have likely been engaged in field work of their own at points not easily accessible to the U. S. mails. One response we received was from Saudi Arabia: for this one we were especially grateful. We hope that those institutions whose ornithological graduate work is not adequately represented in this preliminary list will send us additional information promptly, so that a further report may be more complete.

The degree toward which a student is working is stated in some cases, not in others: we are giving here only such information as has been passed on to us. Theses in the general field of game management, even if concerned with avian species, we have not included. A classified list of graduate theses submitted in American universities between 1934 and 1949 on "subjects related to the ecology and management of wildlife" appeared in *The Wildlife Review* for February, 1950, and its editor, Neil Hotchkiss, of the U. S. Fish and Wildlife Service, has indicated his desire to continue issuing this occasionally to keep it up to date. He has another list in preparation now.

The list which follows is limited to theses which were in progress at the time of writing (July to December, 1950). Some of these may have been completed since that time:

California, University of

Bailey, Robert E.—The incubation patch of birds.

Childs, Henry E.—Population studies of the Brown Towhee (*Pipilo fuscus*).

Cogswell, Howard L.—Size of territory in chaparral birds in relation to vegetation.

Dixon, Keith L.—Comparative ecology and behavior of sympatric and hybridizing species of titmice.

Howell, Thomas R.—Natural history and differentiation in *Sphyrapicus varius*.

Norris, Robert A.—A comparative study of the biology of the nuthatches *Sitta pygmaea* and *Sitta pusilla*.

Richards, Lawrence P.—Morphologic adaptations in the drepaniids of Hawaii.

Salt, G. W.—Metabolic characteristics of three species of finches (*Carpodacus*) in relation to zonal distribution.

Cornell University

Dilger, William C. (M.S.)—A bibliography of the ornithology of India.

Fischer, Richard B. (Ph.D.)—Life history of the Chimney Swift (*Chaetura pelagica*).

Hawksley, Oscar (Ph.D.)—Life history of the Arctic Tern (*Sterna paradisaea*).

Hensley, Marvin M. (Ph.D.)—The ecology of the birdlife in Organ Pipe Cactus National Monument.

Kessel, Brina (Ph.D.)—The life history and management of the Starling (*Sturnus vulgaris*) in New York State.

Meng, Heinz (Ph.D.)—Life history and management of the Cooper's Hawk (*Accipiter cooperii*).

Owen, Oliver S. (Ph.D.)—The ecology of birdlife in a black ash swamp.

Parkes, Kenneth C. (Ph.D.)—Speciation in the breeding birds of New York State.

Reilly, Edgar M. (Ph.D.)—The origin of North American birds, based on studies for the new A.O.U. Check-List.

Florida, University of

Adams, Claude T.—Osteology of the Ardeidae.

Baumel, Julian J.—Comparative osteology of the Fish Crow (*Corvus ossifragus*) and the Common Crow (*Corvus brachyrhynchos*).

Burns, Bartley J.—Ecology of the birds of Newnans Lake, Florida.

Dennis, John V.—Ecology of Florida woodpeckers.

Dickinson, Joshua C., Jr.—Variation in the Towhee (*Pipilo erythrophthalmus*).

Fehon, Jack H.—Comparative osteology of rails.

Glatfelter, Alfred E.—Comparative osteology of jays of the genera *Cyanocitta* and *Aphelocoma*.

Hicks, Thomas W.—Geographical variation of the Bluebird (*Sialia sialis*).

Nelson, Gideon E., Jr.—Ecology of the birds of Welaka, Florida.

Kansas, University of

Baker, M. F.—Natural history of the Prairie Chicken (*Tympanuchus cupido*) in Kansas.

Harder, R. C.—Ecology of the Cardinal (*Richmondena cardinalis*) in eastern Kansas.

Louisiana State University

Arney, S. A. (Ph.D.)—A telescopic study of day-time migration. (Several other Master's and Ph.D. candidates, with specific topics not yet selected, will be working on problems concerned with geographic variation, speciation, life-history, and the mechanics of day-time and nocturnal migration).

Michigan, University of

Batts, H. Lewis, Jr. (Ph.D.)—An ecological study of a 60-acre portion of the Newcomb Tract, near Ann Arbor, Michigan, with special reference to the nesting birds.

Hofslund, Pershing B. (Ph.D.)—A life-history study of the Yellow-throat (*Geothlypis trichas*).

Humphrey, Philip S. (Ph.D.)—Analysis of the Mergini.

Lunk, William A. (Ph.D.)—Life history of the Rough-winged Swallow (*Stelgidopteryx ruficollis*).

Mengel, Robert M. (Ph.D.)—Birds of Kentucky.

Tordoff, Harrison B. (Ph.D.)—Osteology and phylogeny of the Fringillidae.

Texas, University of

Thompson, William L.—Survey of the ecological distribution of the summer birds in the "Canadian Breaks" in Hutchinson County, Texas.

Washington State College

Caskey, Jesse—Melanophores in silky fowl.

Gehrman, Kenneth—Life history of the Lesser Scaup Duck (*Aythya affinis*).

Mewaldt, Leonard—The reproductive cycle of Clark's Nutcracker (*Nucifraga columbiana*).

Schottelius, Byron—Blue Grouse (*Dendragapus obscurus*) populations in Washington.

Trivette, Edward—Leg muscles of charadriiform birds.

Wisconsin, University of

Greeley, Frederick (Ph.D.)—Endocrine factors in adaptation to environmental stress in birds.

Lanyon, Wesley (M.S.)—Evidence of contagious responses in birds.

Nero, Robert (Ph.D.)—Breeding behavior and territory in the Red-wing (*Agelaius phoeniceus*).

Petersen, Arnold (Ph.D.)—Breeding biology and behavior of the Bank Swallow (*Riparia riparia*).

Yale University

Huntington, Charles E.—A survey of the Icteridae.

Paynter, Raymond A., Jr.—Avifauna and speciation in the Territory of Quintana Roo in México.

—Aaron M. Bagg and Gustav A. Swanson

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A WORD TO MEMBERS

The Wilson Bulletin is not as large as we want it to be. It will become larger as funds for publication increase. The Club loses money, and the size of the *Bulletin* is cut down accordingly, each time a member fails to pay dues and is put on the 'suspended list.' Postage is used in notifying the publisher of this suspension. More postage is used in notifying the member and urging him to pay his dues. When he does finally pay he must be reinstated on the mailing list and there is a publisher's charge for this service. The *Bulletin* will become larger if members will make a point of paying their dues promptly.

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